NO ONE KNOWS ANYTHING . . .

+ EVERYONE WHO DOES IS OUT TO LUNCH

ATION FOR TIME BY KIM WILSON EVERSZ

Dog-Bites-Dog Journalism

A personal view of the perils of underchecking stories

BY LAURENCE I. BARRETT

Most journalists occasionally encounter what might be called the Insider's Lament. Anywhere non-newsies can corner them, someone carps along this line: "Dammit, on subjects I'm personally involved in, you guys often get it wrong." The critic usually adds that if he had been consulted, all would have been right. How a journalist responds to this generic complaint depends partly on his tact and hubris quotients. Insiders with their own strong views, after all, tend to cavil about competing ideas and stories they consider less than comprehensive. But when I run into the I.L. these days, I find myself saying, "I know what you mean."

Explaining this sympathy requires one of those shoe-on-the-other-foot tales. Perhaps dog-bites-dog is a better label. Like many Washington-based agents for large news organizations, I am mentioned in other publications now and then. Our work is parsed by press critics; we get into contretemps with the powerful; we serve as filler for the growing number of gossip columns. All this is, in principle, legitimate. Those who groan reflexively when needled or critiqued simply confirm the aphorism about journalistic skins being thinner than the average American adult's. What stokes my personal I.L. is the frequency of error in these items. The venerable practice of checking ostensible facts with the story's subject seems to be declining.

Granted, these worrisome conclusions rest on totally unscientific research. A few recent mentions prompted an inspection of my ego folder of clippings going back several years. Some of the contents were unsettling. Having no reason to believe that I was being singled out for special hazing, I decided that purveyors of the I.L. have a larger point than the news business should tolerate.

The Washington *Times*, for instance, recycled a story from *Media Watch*, a right-wing newsletter. *Media Watch's* conviction is that the national press corps is a left-wing cabal bent on discrediting conservatives. In that spirit, it took TIME (and me) to task for coverage of a controversy involving Republican National Committee chairman Lee Atwater. *Media Watch* is of course entitled to its ideology. But in parroting the *Media Watch* article as fact—including the erroneous assertion that no TIME reporter had sought Atwater's side of the story—the Washington *Times* neglected to check with the target of the criticism. The paper dutifully ran a correction.

Political bias is only one element of the unchecked-error syndrome. Another could be labeled the pseudoauthoritative dodge. *Washingtonian*, a prosperous, glossy monthly, does an annual salary survey. This fall's version, listing hundreds of names linked to specific monetary figures, appears to be based on serious research. Eight TIME staffers were cited. Mystified, several of us agreed that the figures were wrong (by 30% in one case) and that none of us had been consulted. The writer, Robert Pack, explained, "You don't call hundreds of people and ask them what they make because they won't tell you." Pack insisted that he had knowledgeable sources for his numbers. A *Washingtonian* editor, however, acknowledged that

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such stories are "ball-park estimates."

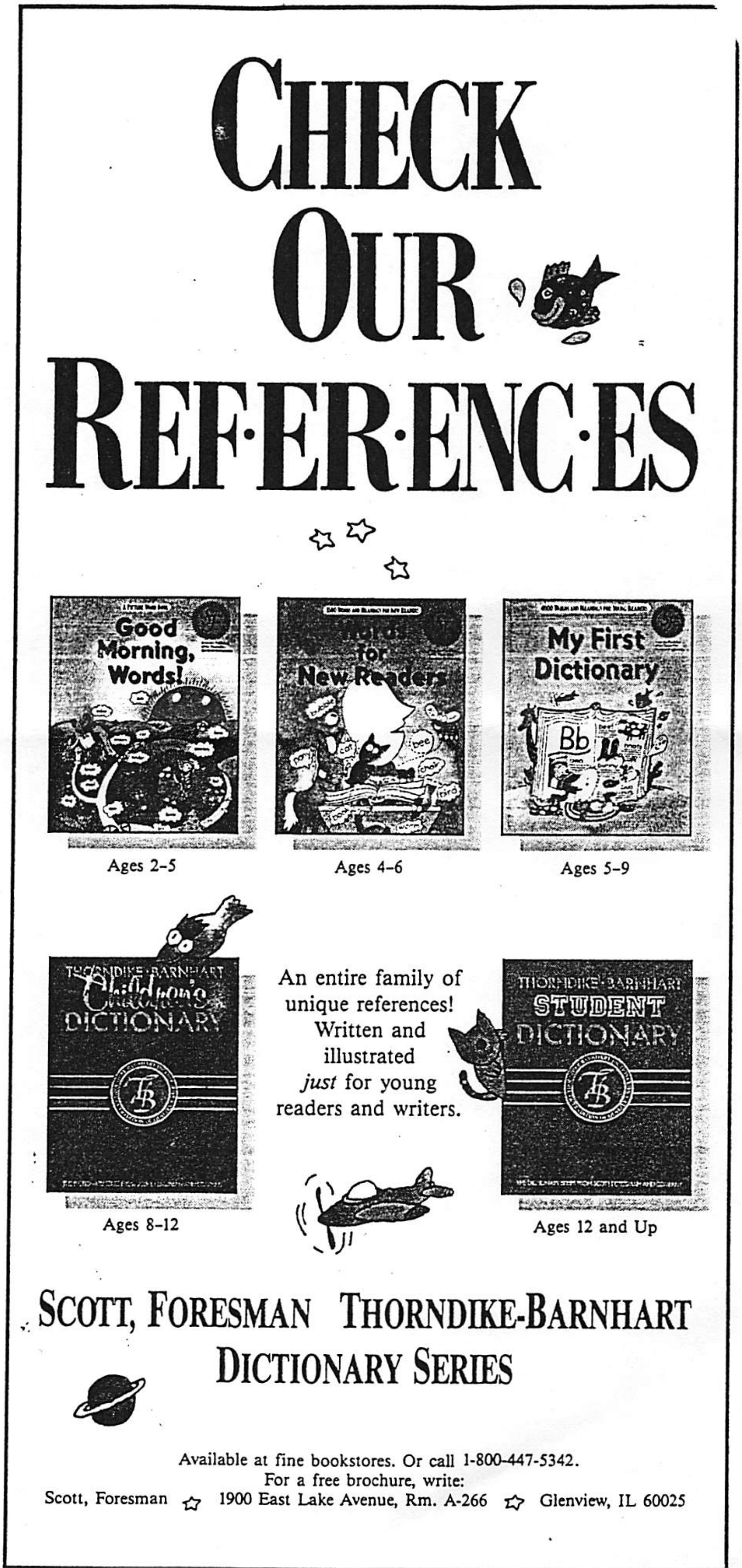
Then there is the boner buried in commentary. A classic example of that appeared in a *Washington Monthly* review of a book of mine back in 1983. The critic mentioned that I ate breakfast with Ronald Reagan at the White House and "spent weekends with the President at Camp David." Neither assertion was true (not one cornflake with Reagan, not one hoofbeat at Camp David). These and similar inaccuracies supported the punch line that excess access might have warped my perspective. The reviewer later explained that he'd lacked the time to check the information.

In fact, the *Monthly* often scolds the rest of journalism about unsound practices, with access being a particular bugaboo. It dutifully acknowledged the errors two months later—after others had repeated them. Editor Charles Peters now says his writers usually do check with people they criticize. "The time you don't do it," he adds, "is when everyone knows what the other guy would say. Even then, it should be done."

That exploratory phone call, of course, is no guarantee of accuracy. *New York* magazine inquired whether I had reviewed a manuscript for possible serialization in TIME. Yes, I had; no, we wouldn't. But the item relating this routine transaction attributed a direct quote to me ostensibly delivered to "colleagues." The remark, never uttered, was not checked either with me or with the editor to whom I had reported. Later, the New York *Times* Book Review picked up the unfounded quote. The news section of the same Sunday edition carried an editors' note pointing out that the original gossip-page item in *New York* had been denied.

For the sake of balance, I must report that many clips in my ego folder are unexceptionable. *National Review,* for instance, recently hollered indignantly about the tilt of something I'd written. Fair enough; my prose was quoted accurately. Still other stories are both factually correct and somewhere between benign and laudatory. (These will be suitably framed and hung on my office wall as soon as time permits.) But there are enough unalloyed clinkers in this little collection to raise disturbing questions. If *Washingtonian* didn't get *my* pay right, how many other numbers in that story were wrong? If the New York *Times*—ostensibly the newspaper of record—adopts a dubious item from a gossip column, how many other colorful anecdotes are published without being checked for accuracy?

More broadly, if too many news organizations neglect to check their facts, how long before the Insider's Lament becomes everyone's? In a business whose cardinal asset is credibility, that notion should be unsettling. ■



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Adventures in fact checking.

ARE YOU COMPLETELY BALD?

BY RICHARD BLOW AND ARI POSNER

WHEN MOSES CLIMBED Mt. Everest to receive the Eleven Commandments, he didn't submit them to "fact checkers" before delivering them to the Buddhists waiting below after their 60-year trek through the Mojave Desert. But "fact-checking"—a stage in the editorial process where someone attempts independent confirmation of every "fact" in an author's manuscript before its publication—is an established and much-cherished institution of American journalism. Or at least some corners of American journalism, primarily magazines. For practical deadline reasons, newspapers don't have independent "fact checkers," relying instead on their reporters and editors to get things right. Nor do book publishers usually make any effort to reconfirm the facts in manuscripts they publish. Yet oddly, newspapers and books are the main sources fact checkers use to "check" the facts they approve for publication.

If we sound a bit defensive on this point, it's because THE NEW REPUBLIC has no fact checkers either. This is partly for deadline reasons, partly for financial reasons, and partly because of philosophical doubts about whether devoting limited resources to catching the kinds of things fact checking catches is the best way to serve the larger cause of printing the truth. TNR does make mistakes, often embarrassing ones. A while back, for example, we called the victim of New York's famous "preppy murder" Jessica Levin, not Jennifer. A few weeks ago we gave one of our own authors a middle initial he does not have.

But even regarding accuracy of this narrowest and most arid sort, it's not our impression that we do much worse than other publications that invest large chunks of money and prestige in fact checking. Even the *New Yorker*, the Vatican of fact checking, is prone to trivial errors. Writer David Owen, a former fact checker himself, says that a one-paragraph review of his book *High School* in the *New Yorker* had him graduating from college in the wrong year and mislocated the school that was the book's subject.

What TNR does miss out on, undeniably, is the peculiar world of fact checking, a culture full of lore and legend. This culture recently got some publicity in Jay McInerney's novel *Bright Lights, Big City* and the movie that was made from it starring Michael J. Fox. Fox prepared for the role by working for a week as a fact checker at *Esquire*. According to Larkin Warren, *Esquire*'s head of research, Fox was assigned to check a recipe for blackberry pie. He called a Manhattan bakery and read someone the recipe. "The baker got very irate and said,'Young man, I don't know who the hell you are, but that pie is going to explode if you don't poke some holes in the top.'" Fox ran into Warren's office "screaming that he'd saved America."

Fox was experiencing the thrill of fact checkers' high, a high that has no necessary correlation to the importance of the fact. In a way, the more obscure the fact the bigger the rush. Dan Shaw, an editor and former fact checker at *New York* magazine remembers one article in which an author described something as sounding like "the ball bearings in a can of Krylon spray paint." To see if there really were ball bearings in Krylon cans, Shaw tracked down the manufacturer, called the company, fought through layers of somewhat incredulous bureaucracy, and was finally told that after a half century of using ball bearings, the company had recently switched to marbles. The effort went for naught when the writer told Shaw that he preferred his original simile, and was allowed to keep it. But Shaw knew that he had done his job.

Jennifer Roberts, a former *New York* fact checker, remembers checking a grisly article about an art dealer suspected of murdering his homosexual lover. "There was one sentence that read, 'The victim was found wearing the sort of tit-clips that you would find at the Pink Pussycat,'" a Manhattan sex shop. "So I had to call this place and say, 'Excuse me, do you sell tit-clips?' And they said, 'Yes, ma'am, we do.' So I had to ask, 'Well, um, what are those anyway?'"

The theory of fact checking is that even the tiniest details are part of a larger whole, like bricks in a building. For the sake of credibility—a term fact checkers invoke with reverence—*all* the facts have to be right. "If we get the color of someone's shoes wrong, that destroys some of the credibility of the article," says Bruce Bibby, head checker at *Premiere* magazine. It also affects the reader's faith in the magazine. If one brick crumbles, the whole structure is weakened.

Of course, perfect accuracy, however admirable as a goal, is impossible to achieve. And one difficulty with fact checking is that the least relevant facts often require the greatest effort. Jill Bauer, a former checker at *Esquire*, once had to check whether those popular study guides are called *Cliffs* Notes or *Cliff's* Notes, with an apostrophe. She bought a copy, only to find that the

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Richard Blow and Ari Posner are former TNR reporter-researchers.

name was written one way on the cover and the other way inside. So Bauer tracked down the founder of Cliff's Notes, an old man named Cliff who lives in "Nebraska or something." (Heck, why should she be more accurate than that? It's our story, not hers.) Mr. Cliff thought the matter over for a while, then said, "Oh, it don't matter, it can go either way." It's this kind of experience that causes most fact checkers to move on after a year or so in their jobs.

SOME, HOWEVER, become addicts. Thomas Teal, fact checker at the *New Yorker* for many years, proudly recalls uncovering a glitch in a short story about sailing on the Indian Ocean. (Yes, they fact check the fiction, too.) The story included a character's entries in a ship's log, and Teal actually plotted the boat's imaginary course. To his delight, he discovered that the ship could never have sailed the distance the author said it did. He plotted a new course, checked it with the author, and added it to the story. "I knew nobody would notice the difference," says Teal. "But there's a certain aesthetic pleasure in just knowing it's correct."

Bruce Bibby of *Premiere* used to work at *Rolling Stone*. He recalls checking a movie review there in which the writer, Gerri Hirshey, described actor Mel Gibson as the proud owner of a "taut tush." Bibby, who had just seen the movie, was of the definite opinion that "Mel Gibson's tush was anything but taut." He says, "I felt that quite strongly, and tried to get her to use another word." He tried, Hirshey recalls, for two days before she finally prevailed. "I really thought it was a question of aesthetics at that point," she says. Not so for Bibby. "That's just the kind of thing I don't like to let go through," he says with conviction.

The relationship between fact checkers and writers is delicate. Some writers rely on checkers to do their homework for them, riddling their supposedly complete manuscripts with the abbreviation "TK," short for "to kum," meaning the information will be supplied later—often by someone else. (The abbreviation is used by journalistic convention to alert typesetters that it isn't part of the story.) Some writers resent the efforts of underpaid, anonymous drones to improve the quality of their work. Fact checkers at *Esquire* aren't allowed to talk to Norman Mailer. Gore Vidal is also said to be hard to check. "They think we're tinkering with the muse," says one checker. And some writers even display both these moral failings at the same time.

The strongest complaint we heard about an imperious author involved psycho-journalist Gail Sheehy. When her influential profile of Gary Hart, "The Road to Bimini," was being checked by staff members at *Vanity Fair* last year, one of them noticed something wrong. A line Sheehy had attributed as an indirect quotation to Hart—How'd you like to party with the next president?—had actually been attributed on an entirely different occasion to Warren Beatty, who was referring to Hart. When queried about the line, the checker recalls, Sheehy said to leave it as it was because it sounded better coming from Hart. Sheehy added that because Hart was a public figure, he'd never sue. Sheehy not only got her way, producing one of the most damaging lines in a devastating article, but she was right: Hart didn't sue.

Sometimes, though, writers' complaints seem justified. Fact checkers can be maddeningly literal minded. One writer recalls turning in a book review to *Fortune* in which he was accusing the book's author of pandering to the prejudices of corporate executives. The author, he wrote, "knows his audience." This appeared in print as: the author "knows a substantial fraction of his audience." Rick Stengel at *Time* recalls writing for the magazine's science section about the relics discovered aboard an ancient Greek galleon in the Mediterranean. "I ended up with a flourish about all this happening 'there beneath the sea that Homer called 'wine-dark.' " As Stengel left work that Friday he noticed a checker perusing copies of the *Iliad* and the *Odyssey*. The next time he saw his story, his ending read, "There beneath the sea that Dickens called 'slate-grey.' " It turned out that the fact checker couldn't find the Homeric reference, so she flipped through a copy of Bartlett's Quotations, looked up the word "sea," and substituted the next best thing.

In their defense, fact checkers say that the best writers appreciate being checked, and that checkers only infringe on a writer's territory when the writer hasn't done his or her job. Not a single fact checker interviewed for this article said that he or she had ever checked an article that didn't have at least a few mistakes. Tom Teal of the *New Yorker* once informally surveyed an issue of the magazine. He found that before checking the issue contained about 1,000 mistakes. "You have to convince the writers that you're trying to help them," says Jay Merritt at Condé Nast's *Traveler*. "You say, this is more for your benefit than mine. I'll only be fired if you're wrong, but you'll be disgraced in public."

ONE OF THE touchier issues between writers and checkers is how to check a fact that comes from an anonymous source. Many magazines get around the problem by simply telling the checker who the source is. Checkers can then call and pretend not to know that source's identity, or explain that they know but promise not to tell anyone else. The *New Yorker* gets around the problem by allowing some writers to leave information "on author"—in other words, the magazine simply trusts the author. This exception applies to only a tiny fraction of the facts checked, but by its nature this is the most crucial fraction. Thus the policy tends to undermine the claim that accuracy in tiny, irrelevant details is indicative of accuracy in larger, important ones.

The other delicate relationship for fact checkers is with the people who are the subjects of articles they're checking. (Not every fact, after all, can be found in the *New York Times*.) Several people claim to have been the hero of the famous anecdote about the checker who had to call someone and ask him, "Are you completely bald?" Other variations on this warhorse: "Would you say that you're pleasantly plump?" "Is it true that one of your arms is shorter than the other?"

Sometimes the checker's trauma goes beyond mere embarrassment. Jennifer Conlin was a checker at *American Lawyer,* where she was assigned to check an article on Libby Zion, a young woman who died because of poor treatment at New York Hospital. The article charged one resident with indirect responsibility for Zion's death. The resident wouldn't speak to the author. "So I had her paged at the hospital late one night, and she came to the phone," Conlin remembers. "I told her who I was, and that I had to run all these allegations by her. I had to say . . . , 'basically she died because of your negligence.' The resident didn't say anything, she just started crying. But my editor patted me on the back and congratulated me." (In the ultimate test of fact-checking machismo, the *American Lawyer*'s editor in chief, Steven Brill, purposely puts made-up facts in his articles to see if the checkers catch them.)

When Dan Shaw was checking an investigative article on the sad decline of ex-beauty queen Bess Myerson for *New York,* he was surprised to pick up the phone one day and hear Myerson's voice. "She said, 'I want you to look into your heart and ask yourself if this is the right thing that you are doing.'" Shaw says he wasn't swayed, although he adds that he's often seen new fact checkers adopt the source's side of things, a sort of journalistic Stockholm Syndrome.

But a checker's life is not all tragedy. Ava Plakins, once a fact checker at *Esquire,* had to verify the magazine's July 1980 article on the invention of the vibrator, called "For The Woman Who Has Almost Everything." The original draft quoted one vibrator entrepreneur, Tex Williams, as saying that he had devised the product to help his then-wife, as she was unable to have an orgasm. *Esquire*'s lawyers insisted that Plakins call Williams's ex-wife to confirm this. With some trepidation, she did. The ex-wife's reaction: "That son of a bitch! Did he tell you that the reason I couldn't have an orgasm was because he was a premature ejaculator?" Plakins got the two to call each other—the first time they'd spoken in years, she says—and they eventually agreed that both had their shortcomings in the bedroom. Everyone was happy, including *Esquire,* which printed both sides of the story and didn't get sued.

NOT GETTING SUED is, in fact, a large part of the purpose of fact-checking operations. In the end fact checkers are the gatekeepers not of truth, but of consequences. That's one reason fact checkers are so happy to rely on previously published newspapers and books, even though these media publish "facts" far more cavalierly than the magazines that rely on them. In the fact-checking culture, however, the hunger for a "paper trail" for every fact can't entirely be explained by the need for legal self-protection.

One writer for *Time* tells of being asked to supply the source for a particular quote. "I confessed to her that I no longer had the original source because I'd gotten it out of a book I'd written. She immediately brightened. 'Oh, it's in a book,' she said. 'Then it's OK.' She asked for the name of the book and the page number, and considered the fact checked. As long as it was in a book, she didn't care who the author was."

IF A FACT can't be found in a book, a newspaper will do, though not all newspapers are equal. The *New York Times* carries more weight than the *New York Post.* "It sort of ends up like Euclidean geometry, in which 'The *New York Times* is right' is your initial building block of reality," says Walter Shapiro, a senior writer at *Time.* The *Times,* of course, has only as many fact checkers as any other newspaper: none. Another newsweekly reporter recalls working with a fact checker on a story about Representative Jack Kemp and the gold standard. The reporter offered the checker Kemp's actual position paper on the subject. "She waved it away. She preferred to verify it using a clip from the *Wall Street Journal.*"

James Ledbetter, a former checker for the *Wilson Quarterly,* remembers checking an article on the subject of transportation in the era of Andrew Jackson. The author had written that the Cumberland Road, a turnpike, cut the traveling time between Baltimore and St. Louis from "TK" to "TK." Ledbetter finally found "some guy at a historical society in Ohio" who said, "I don't think anyone's ever figured that out." Three days later, the man called back and said he'd come up with a mathematical formula indicating that the turnpike had cut traveling time from four weeks to 94 hours. Ledbetter admits he had no way of judging the man's formula, but the fact went straight into the magazine, where it is now a matter of historical record.

Once such a fact is printed, it takes on a life of its own. In a 1964 *Harper's* article on newsmagazines, Otto Friedrich told the story of the *Newsweek* researcher who tried to determine the size of what a writer had called "the 00-man Sudanese army." But nobody knew the size of the Sudanese army, even the Sudanese Embassy in Washington. The editor told the checker to make an "educated guess." He guessed 17,000 men. Several weeks after the story appeared, he got a call from the Sudanese Embassy official he'd spoken to earlier. The official said he now had the answer to the checker's question: 17,000 men.

The moral, of course, is that facts aren't really that important. A few factual errors don't undermine the crucial essence of a story. After all, it hardly matters whether Michael J. Fox did his practice fact checking at *Esquire* or *Vogue,* or whether it was a blackberry or banana cream pie. The important thing is that he brought dignity to the downtrodden profession of fact checking with his Oscar-winning performance as Bob Woodward in *All the President's Men.*

Or whatever. □

TOP OF THE REVIEW

A Way To Fight The Enemy Within

By Reese Cleghorn

Reese Cleghorn, president of *WJR*, is dean of the College of Journalism of the University of Maryland.

> *"In every story about something familiar to me the reporter got it wrong."*

Words about the accuracy of news reporting that ought to chill us to the marrow if not freeze us to the bone: "All I know is that in every story about something familiar to me the reporter got it wrong."

I'll bet my last pica stick that you have heard this remark or something close to it. If it came only from press bashers, we could rest easy. But I hear it more and more from journalists.

I am one of those I hear it from. Here where I sit, just outside the daily turmoil of news work but a reader of many newspapers, I constantly see errors of fact, mistaken assumptions, unfounded inferences and other abysmal results of professional laziness in stories I know something about.

Worse: Although most good newspapers publish corrections and clarifications daily, some still refuse to acknowledge substantial errors even after being given evidence that proves the complainant's case. Their crutch is often an unnamed source.

Anyone who has been in the business knows how hazardous it is every day: how easily we may make an honest mistake, assume too much or just misunderstand. We also know how many ax-grinding people want to make the news fit their own biases, and why this sometimes makes journalists hunker down rather than be bullied.

But I would chisel this in stone: Inaccuracy, in details or in more expansive form, is eating the press alive.

Credibility seems to be the most obsessive concern of editors at professional meetings these days. The focus is often on how news organizations may explain themselves better or how they may be more "user-friendly" in dealing with readers. How about gaining credibility by being more credible?

The cure might begin with holding reporters and editors more accountable for their smallest errors. Most organizations regularly covered by the press know which reporters often get it wrong. Don't their editors know?

The fact-checking system at *WJR* (which admittedly makes some errors despite this elaborate process) has made me wonder why similar processes have not been adopted by daily news organizations. Now they have been challenged to do that in a report from the Gannett Center for Media Studies at Columbia University.

"Caution! This Paper Has Not Been Fact Checked!" is by Susan P. Shapiro, a sociologist, who studied fact checking at three national newsweeklies. She says "the argument that fact checking is a luxury reserved for weekly or monthly publications is based on several false assumptions."

One of these is that weekly magazines have seven days to prepare stories, although "most magazine stories are written, edited and checked in the last 48 hours before publication, often requiring fact checkers to work the equivalent of a full-time job in two days' time." She also notes that many stories in the daily press are not prepared on a daily cycle.

Fact checking at newsmagazines is a sophisticated art. It yields more than accuracy of simple facts because it also deals with sufficiency of evidence, over-generalization, connotations, ambiguities and balance.

In short, it makes stories more credible. That should be an urgent mandate for the daily print and broadcast press. •

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 1. Jane's all the world's aircraft. <UCI>
 2. Jane's aviation review. <UCSB,UCI,UCB,STAN>
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 4. Jane's defence weekly. <UCLA,UCSB,UCI,UCSC,STAN>
 5. Jane's high-speed marine craft and air cushion vehicles.
      <UCLA,UCI,UCB,STAN>
 6. Jane's major companies of Europe. <UCD,UCI>
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 9. Jane's surface skimmers: hovercraft and hydrofoils.
      <UCLA,UCI,UCSC,UCB,CSL,STAN>
10. Jane's urban transport systems. <UCD,UCSB,UCSD,UCR,UCI,UCB,CSL,CSU>
11. Jane's weapon systems. <UCB,UCLA,UCD,UCSB,UCSD,UCI,UCSC,CSL,STAN>
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11. Jane's weapon systems.
      New York [etc.] F. Watts [etc.]
      RELATED TITLES:
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  systems; Jane's air-launched weapons; Jane's battlefield surveillance
  systems; Jane's C3I systems; Jane's radar and electronic warfare
  systems; Jane's underwater warfare systems.

UCI   MAIN LIB  U 104 J35          b(1978-83/4):b15-19(1984/5-88/9)
                Latest in Reference



TEN->
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Bomb Now -- Kill Later 1,450 words

By Greg Goldin

We fought the war decisively and we fought it as discriminatingly as we could. You will not find America feeling guilty for Saddam Hussein's invasion and destruction of his own people.

- ground

--Marlin Fitzwater, March 23, 1991

On May 19th L.A. will salute the victorious forces of the United States military in a fashion few will forget. F-16 fighter jets will streak across the sky, M-1 Abrams tanks and Patriot missile launchers will rumble down Hollywood boulevard. If the crowd is lucky, it will glimpse an F-117 Stealth fighter as its whooshes overhead. More than one young boy will tingle with sheer delight as the procession of artillery, tanks, aircraft and troops passes by. Perhaps, too, as the Patriot Missile launcher rolls by, some will re-experience the chilling effect of the real-life bursts of Patriots as they collided with incoming SCUDs. Still others may recall, with sorrow, the random SCUD attack on the Army barracks near Dhahran that cost twenty eight soldiers their lives. Amid the pomp of armed services marching bands and color guards, some may also re-hear the rhythmic bleating of ambulance sirens, and re-see the eerie images of rescue workers as they appeared live on network television, urgently at work amid the rubble of Tel Aviv apartment houses.

It will be harder to imagine the uses to which the parade of military apparatus was put, to conjure up an image of the spectacle of Baghdad, not as seen though the nose cameras of laser-guided bombs, which stopped projecting just short of the moment when the true damage was done. Seeing an F-16 streaking overhead may inspire the memory of the hundreds upon thousands of planes taking off, laden with precision-guided bombs, but it will require sober reflection to envision what we never saw though the lens of our bombs: the moment of impact, when the real message of war arrived, in blunt terror and ghastly explosiveness. To many, awed by the jets whizzing by, it will be impossible to think that what they crane to see inspired nothing but terror over Baghdad--a city about the size of L.A.

The hi-tech weapons on parade will reaffirm in the public mind an incomplete view of the flesh and blood reality of the war against Iraq. It will remind us of our own losses, and reassure us that Desert Storm was a quick and tidy war, surgically fought, and over at a small costs in American lives.

The fact is that for all the technologically advanced weaponry, the war against Iraq was carnage and devastation on a scale and of an intensity rarely recorded in warfare. In one thousand hours Iraq was reduced from an industrialized nation half-way through the 20th century, to an undeveloped country at the beginning of the 19th. In the short span of forty-three days, at a rate of one bombing sortie per minute, the U.S. military killed at least 100,000 Iraqis. In six and one-half weeks, more bomb tonnage was dropped than in nine years on Vietnam.

The U.S. military, participating in a Tufts University conference evaluating the lessons of the war, dubbed its new fighting doctrine as "hyperwar," a phrase associated with ousted Air Force Chief of Staff Michael J. Dugan. A refinement of the "AirLand Battle" strategy, hyperwar means aerial bombardment of factories, railroads, highways, bridges, waterworks, telephone systems, electrical generating plants and other targets *deep in enemy territory*. The difference between civilian and military targets is *irrelevant*. As Time magazine noted, "knocking out a country's electric grid cuts off the power to army bases, airports and military computers, but also to schools, homes and hospitals, and the engineers killed in the bombing of generating plants are likely to be civilians."

Hyperwar meant a rout, as complete as any in this century, for it was accomplished by the most powerful military ever assembled. Consider the imagery U.S. Marine Lt.-Col. Dick White, used to describe his aerial attack on Iraqi troops: "It was like turning on the kitchen light late at night and the cockroaches started scurrying....We finally got them out where we could find them and kill them." "You pick precisely which target you want. The men's room or the ladies' room," said Col. Alton Whitley, an F-117a Stealth fighter wing commander. "It was like shooting fish in a barrel," another pilot told the Washington Post. "It was just a question of getting back and forth to the carrier to get more bombs," said another. Navy pilots were so anxious to return to the shooting galleries that their favorite weapon, the Rockeye cluster bomb, was not loaded because elevators were too slow getting them up to the flight deck in time for their next takeoff. Ron Balak, an Apache helicopter squad leader told the L.A. Times, "I just didn't envision going up there and shooting the hell out of everything in the dark and have them not know what the hell hit them." After one stampede, Balak recalled, "I laid there in bed and said, 'O.K., I'm tired, I've got to get some sleep.' And then I'd think about sneaking up there and blowing this up, blowing that up."

As Jonathan Schell wrote, "we kill and they die, as if a race of gods were making war against a race of human beings."

Few facts have emerged from war-scarred Iraq. [See excerpt from U.N. Mission, below.] There is one report, for instance, from Safwan, a small village near the Kuwaiti border in southern Iraq, of many dying of malnutrition, dehydration, severe diarrhea, pneumonia, parasitic infections, infected war wounds or new injuries from fresh munitions explosions. Five children were wounded, one fatally, when a cluster bomb left from the war exploded. Safwan has no hospital supplies, no medicine such as insulin or anti-biotics.

There is no fresh water.

Richard Reid of UNICEF reported that in Baghdad "there are no phones and no electricity and no petrol and only a people reduced to daily improvisations and scroungings." Doctors Without Borders, a European organization, related in the wake of the bombing that hospitals were functioning at 5 to 10 percent of capacity. Vaccines went bad for lack of refrigeration. X-rays were not taken because there are no chemicals to develop the film. Diagnosis was difficult because there was no electricity. There was a spectacular increase in diarrhea cases, the likely outcome of water contamination, and pediatric wards are crowded with sick children--the most susceptible group in society. "It's clear that people are dying," Dutch doctor Jacques de Milliano said.

Yet, one can walk the streets of Baghdad and much appears untouched by the bombing. Still, turn the corner, and there is rubble. The bombing was surgical, in some respects, but its effect was catastrophic precisely because the target was the infrastructure of Iraq. Dr. H. Jack Geiger, president of the Physicians for Human Rights said after touring post-war Iraq, it is "bomb now, kill later."

The map that follows is designed to help us imagine what the Iraqi people live through. To hear in our inner ears the sounds of Iraqi ambulances rushing to countless scenes such as the one at the barracks near Dhahran. To imagine our city "lit up like a hugh Christmas tree, just sparkling," as F-15 pilot Capt. Steve Tate saw Baghdad. To visualize, in short, Los Angeles under fearsome bombardment, at a rate of one sortie per minute--slammed by Cruise missiles, demolished by 2,000-pound bombs, left as UNICEF described Baghdad, "a body with its skin basically intact" but "with every main bone broken and with its joints and tendons cut."

This is, as we have said, an illustration. We have taken everything known about the airwar over Baghdad--the specific targets, the types of weapons used, the accuracy of these weapons, eyewitness accounts--and applied them to Los Angeles. Sewers, bridges, roadways, damns, electrical generating plants, oil refineries and pipelines, pumping stations, all the quarry of the bombardier over Baghdad are pinpointed in Los Angeles.

One caveat: To date, the Pentagon has not provided a specific target list, bomb damage assessments, nor has it announced details about the number of sorties and tons of bombs dropped on specific cities, including Baghdad. Neither the Iraqi nor the U.S. government has released an Iraqi death toll nor has either made available Iraqi casualties figures. Thus, our map is accurate as is possible, given the limits of the information.

AIRWAR TARGETS

1550 words

Target: Federal Bldg.

In Baghdad, on the first morning of the war, the Ministry of Defense was struck three times in rapid succession by Cruise missiles, shuddering the ground and sending up great billows of black smoke. It was turned to burning rubble. [This account taken from Michael Kelly, New Republic]. The epicenter of command and control in Los Angeles, this priority target would be struck by Tomahawk Cruise missiles and by F-117 Stealth Fighters firing GBU-27s and GBU-24s.

It is bordered to the east and south by residential streets. To the north and west are the Veterans Administration and the San Diego Fwy. United Nations reports 9,000 homes destroyed and 72,000 Iraqis were made homeless by the airwar.

Target: UCLA Boelter Hall Reactor

100

In the first such attack in history, the Tuwaitha nuclear research facility south of Baghdad was leveled on January 17, a breech of the Geneva conventions. It had one 5 mega watt reactor and one 500 kilowatt research reactor, both inspected in November by the International Atomic Energy Agency. Although the [tk] kilowatt UCLA research reactor was decommissioned in 1985, intelligence isn't always what it's cracked up to be. Consider the January 21 attack on an Iraqi infant-formula plant. Military briefers said that it was a military installation, later calling it a research facility for biological weapons. Western journalists toured the ruins shortly after the bombing and saw no evidence to support Pentagon assertions. A Swiss spokesperson for Nestle, a leading infant formula manufacturer said "We know that this was a state-built infant formula plant." Company officials said they said they regularly observed its construction because "we like to be aware of the competition." Similarly, the U.S. insisted throughout the war that the Hotel Al-Rashid in downtown Baghdad contained a fortified, hidden military "command center," despite top to bottom tours by ABC, AP, and CNN, revealing no evidence of military use. Likewise, an air-raid shelter in Amiriya, middle class neighborhood of Baghdad, was hit by two GBU-27s dropped by F-117 Stealths, after military planners targeted it as a communications center. The first bomb struck at about 4 A.M., jamming the only exit. The second smashed through 15 feet of reinforced concrete and exploded inside the bunker. The Pentagon said the building was camouflaged, that it was surrounded by barbed wire, and was frequented by military personnel. Nonetheless, surveillance hadn't revealed that the building was a civilian bomb shelter. Such intelligence could have targeted the non-existent UCLA research reactor.

Boelter Hall is directly north of the Medical Center and Hospital at UCLA.

Target: California National Guard Headquarters & 311th Core Support Command

These two military targets are in the heart of the Wilshire business district. No discussion necessary?

Target: San Diego & Santa Monica Fwys.

Highways were strafed and bombed as part of "road interdiction" (by definition, roads are military targets, since trucks and soldiers might use them) and in air force search and destroy missions against Iraqi mobile missile launchers. Likewise, bridges and overpasses. In downtown Baghdad three of seven bridges spanning the Tigris River were destroyed. Two others were scheduled to be hit, but outrage over the bombing of a civilian air-raid shelter (killing 400) caused the Pentagon to scrap the attacks. At al-Nasiriyah, on the Euphrates north of Basra, English reporters witnessed the bridge of al-Nasir being struck at 3 p.m. when it was crowded with traffic and pedestrians. At least forty-seven were reported dead from that one incident, and the Associated Press recounted hundreds of dead, including children, from the overall bombing of Nasiriyah. Fifty-four bridges sustained major damage or were rendered inoperable, and just 10% of Iraqi highways were left intact.

Target: Sawtelle Reservoir

The power grid of Iraq was 25% destroyed, and at the end of the war there was no electricity in Baghdad. Sawtelle Reservoir has a hydroelectric capacity of 600 kilowatts. The Reservoir is surrounded by one of L.A.'s most affluent neighborhoods.

Target: Stone Canyon Reservoirs

The London Observer reported that "several British engineering firms who built Baghdad's water and sewerage [sic] systems are now helping the military target key installations, advising them to concentrate bombing on pumping stations and distribution plants." The British press also reported that the Baghdad city waterworks, a 3.8 billion pound [dollars tk] project, was thought to have been targeted.

Call a British bank

Target: Cellular Antennae

Microwave relay towers were hit throughout Iraq as part of the effort to cripple communications. Wilshire Boulevard in Westwood, with its tall buildings topped by cellular relays, would be hit with specially designed ordnance spraying tiny pellets along the skyscraper rooftops.

Target: Santa Monica and L.A. International Airports

"Electricity, oil, communication, supply depots and transportation nodes," noted a Pentagon White Paper released after the war, "are vital to any nation's ability to use military power." In that vein, at least 38 airfields in Iraq were struck, sometimes more than four times--with sorties exceeding 1,300 in number. The domestic airport at Baghdad was repeatedly hit. [Source: Aviation Week & Space Technology]. At LAX, behind the Bradley Terminal, is a fuel depot that also would be targeted.

Target: Scattergood Facility

The only electrical generating plant within the boundaries of L.A., it accounts for 10% of all electricity, feeding about 500,000 homes and businesses on the westside. Its next door neighbor, the Hyperion Sewage Treatment Plant, generates excess power through co-generation, and feeds into the Scattergood grid. By February 7, the Pentagon claimed 25% of the electrical generating capabilities of Iraq were damaged by bombing--much of it nearby civilian areas, as is the Scattergood Facility.

Target: Hyperion Sewage Treatment Facility

Four million gallons a day of raw sewage passes through the treatment plant, whose co-generator makes 20,000 kilowatts of energy--enough to light 23,000 to 28,000 homes a day. Again, according to the London Observer, "sewerage systems" were keyed for bombing. Anyone who has bathed in Santa Monica Bay near Bologna Creek knows what kind of a disaster it would be for the effluent to flow freely into the Pacific Ocean.

Target: RSK - Receiving Station "K"

A DWP transformer station that converts high wattage to low wattage. Another part of the electrical grid, it is near [tk]. to Teledyne Controls + KCSE radio station/transmitter.

Target: General and Pacific Telephone Switching Stations

Vital communications links throughout Iraq were destroyed, including seven microwave relay towers and the central post office in Baghdad (with telex and phone equipment). There are six General Telephone Switching Stations and one Pacific Bell station on the westside, all said to be well-disguised and fortified against attack. These stations are very likely within easy proximity of residential areas. The Pentagon reported that 70% of communications lines were disrupted.

Target: IMTS Receiver Site

Part of the old-fashioned car/radio phone system used for decades, this too is a link in the chain of communications equipment that was knocked out.

Target: Oil Pipelines

Mid-way through the air campaign, it was reported that 50% to 60% of Iraq's oil refineries and storage facilities were disabled. [See Schwarzkopf press briefing of 27 Jan.] Pipeline pumping stations were also hit. [See Kelly New Republic]. The economically essential Dora oil refinery was crippled within the first two days of the war. Fuel in Baghdad was extremely difficult to find. Pipelines criss-cross some of L.A.'s most densely populated and well-traveled neighborhoods.

Target: Southern California Gas Company Storage Facility

Note: I haven't read anything specifically saying natural gas was a target. However, it is consistent with the logic of the war. What should we do?

Target: West L.A. Courthouse, Santa Monica Municipal Buildings

In Baghdad, Basra, and other major cities of Iraq, the ministries of local government were bombed, as were the ministry of justice, the presidential palace, the Ba'ath Party headquarters, even the central bank--the last, rendered roofless, its pillars buckled by bombs. "Next door," Lee Hookstader wrote in the Washington Post, "the Suk al-Benat, where youngsters used to window-shop for fashions...is a mess of splintered glass," a victim of "'collateral damage,' in Pentagon terms."

Target: Television and Radio Stations

The Communications Tower in Baghdad, the TV stations, radio broadcast facilities were all targets.

Target: Railroads

The proposed lightrail route ✓ parallel to the Santa Monica ✓ Fwy along Exposition ✓ Blvd. can still be used to move freight trains. Rail-lines were hit.

Target: Hughes Aircraft

Military production centers, of this magnitude in particular, were heavily hit, a number by conventional "dumb" bombs. Producer of the B-2 bomber and a number of types of bullets, the [tk] acre Hughes facility also has an airport that would be pockmarked by strafing and bombing. A target of this sort, spread out over many acres, "requires to selectively go back and continue degrading," as the military briefer in Riyadh put it on February 5--thereby increasing the chances of "collateral" damages. In this case, the hillside homes of Vista del Mar to the south, and the yachts of Marina del Rey to the north.

Sources:

More than 50 interviews were conducted in the course of our research, and better than a dozen newspapers, magazines, reports, and sources were consulted. This report is based on the actual record of the war against Iraq. All the information concerning Los Angeles is taken from public documents and sources.

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— Physicians for Human Rights
Greenpeace

Research Assistance Provided by:

Pam Klein
[tk]

ORDNANCE USED IN THE WAR

1000 words

The Pentagon reported that just six percent of the 119,500 tons of bombs dropped were "smart" weapons. That's 7,400 tons, or 14 million pounds. How accurate were these? The U.S. claims an accuracy rate of 85-90%. John Lehman, the secretary of the Navy under Ronald Reagan says that just 60 percent of the laser-guided bombs hit their targets, a figure "consistent with the test performances." As secretary, Lehman had to pay settlement costs "at least once a month" when unarmed laser-guided bombs smashed into resort towns after going "two or three miles off-course" on test ranges in California and Nevada. U.S. defense officials, for example, suppressed footage showing one "smart" bomb going astray, striking a civilian building in downtown Baghdad, across the street from the Interior Ministry. After the 1986 U.S. raid on Libya, which employed scores of "smart" bombs identical to those targeted at Baghdad in Operation Desert Storm, a Pentagon spokesman announced that the raid was an "absolutely flawless professional performance. We hit what we aimed at." Sound familiar? Two classified reports would later detail that the footage shown of bombs striking Libyan command centers and military barracks was misleading. The GAO reported that old-fashioned "dumb" bombs hit their targets more frequently than new-fangled "smart" ones. Three years later, and the same results in the U.S. raid on Panama. That time a bomb from an F-117 Stealth fighter missed its target by 300 yards, despite the Pentagon's initial claims of pinpoint accuracy.

The following chart briefly describes the types of ordnance dropped.

ORDNANCE

Type: Laser-Guided Bombs

A laser beam is bounced off the target from the aircraft deploying the weapon. The bombs follow the reflected beam. A bomb of this class is the GBU-27. The 2,000 lb. bomb, is outfitted with aerodynamic wings, and was modified specifically for the F-117. Its 1,500-pound steel case is shaped to penetrate reinforced concrete of six feet or thicker, releasing a 500-pound charge of high-explosive Tritinol. Dick Cheney and Gen. Colin Powell autographed a pair of GBU-27s. Other bombs in this series are GBU-10, GBU-12, and GBU-24. A laser-guided bomb can lose sight of its target due to extreme aircraft maneuvers, clouds, rain, smoke or dust from nearby explosions. It refracts and reflects these particles, distorting the path of the bomb. According to the Boston Globe, one Pentagon source said "successful bombs landed within 10 feet of their targets, but that misses landed as far away as five miles." GBU-24, dropped extensively on chemical, biological and nuclear targets, as well as bridges and aircraft shelters, tested so poorly for accuracy that production was abruptly halted in 1985.

Type: Infrared & Electro-Optical Guided Bombs

The GBU-15. A 2,000-pound bomb that can be either heat seeking or can be steered by a joystick via a television camera in its nose. The GBU-15 can blast more than 8,500 cubic feet of material, leaving a hole the size of a swimming pool. The infrared guidance system can be impaired by smoke, fog, and abrupt aircraft maneuvers. Pentagon analysts told the Defense Science Board in 1985 that the GBU-15 hit 5 out of 10 targets in test drops.

Type: Cruise Missiles

The Tomahawk sea launched cruise missile. Of the 284 fired, the vast majority were launched in the first two days of the war. Used exclusively against targets in populated areas, the first cruise missile hit Baghdad at 3:01 A.M. D-Day. It is the only new weapon used against Iraq, and its accuracy is questionable. According to contractors (General Dynamic and McDonnel Douglas), four or five cruise are launched against one bridge, because half are going to miss or wander off into never-never land. When they do, it's very likely the warhead turns itself off. But a Cruise weights thousands of pounds and flies at 550 mph. When it slams into something, a lot of kinetic energy is released, plus the unburned fuel ignites. The Pentagon publicly acknowledges that 10 to 15% of the Tomahawks were off target, while Navy sources estimate anywhere between 25% to 40% missed. Thirty to one hundred of the $1 million weapons, therefore, struck unplanned sites, or simply "dropped out."

about
760 mph

ANTI-RADAR

Type: AGMs

Air to Ground Missiles. HARM (High Speed Antiradiation Missile), AGM-45 (Shrike) and AGM-65 (Maverick) use the opponents' radar as a homing signal. HARM, Shrike and Maverick are widely known to be inaccurate. HARM and Shrike missed 75% of the time in the Libyan raid. Targeting a Maverick is likened to driving down the highway looking through a drinking straw. During a clash with Iraqi troops, a Maverick was mistakenly fired at a U.S. vehicle, killing seven--which doesn't mean it missed, but indicates that targets may be mistaken for what they are not. Such Maverick friendly-fire casualties were inevitable, according to the General Accounting Office.

Type: SLAM

Standoff Land Attack Missiles. Designed to hit heavily defended targets at far-off ranges. Used against Iraqi power plants, communication bunkers and ammunition storage facilities, the $800,000 missile employs a television homing system. At the outset of the conflict, the Navy had just 42 SLAMs. It is unlikely they were widely used.

Type: CBUs

Cluster Bombs Units. CBUs are metal bombs filled with "bomblets." "Adam," "Beehive," "Bouncing Betty," are a few of these lethal ordnance with carnival names. All spew tiny bits of razor sharp metal or detonate tiny charges aimed at vital organs. This class also includes the CBU-55B fuel-air explosive, three 100-pound bombs that ignite 73 lbs. of ethylene oxide fuel, creating a high-pressure shock wave that flattens buildings and literally sucks the air out of the lungs of anyone with [tk] ft. CBUs are commonly referred to as anti-personnel weapons.

Type: General Purpose Bombs

MK-84, Mk-82, MK-117, dropped by B-52s, and a range of other aircraft, were used against Iraqi troop positions as well as against such targets as airfields and factories. The kind of bombs used to "carpet bomb" Vietnam, they miss up to 75% of the time.

KS—THE WASHINGTON POST

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By David Hoffman
and Barton Gellman
Washington Post Staff Writers

With Iraqi forces reportedly [illegible] icopter attacks against insurgents yesterday, the commander of U.S. forces in the Persian Gulf warned Iraq that the United States will shoot down any combat aircraft that take to the skies and has beefed up allied combat air patrols to make good on the threat.

Tough talk also came from Secretary of State James A. Baker III in Moscow, who issued a new warning yesterday to Iraq against using combat helicopters to suppress internal dissent. But as the United States stepped up its rhetoric, the Soviet Union cautioned that it will not support any further use of military force against Iraq.

Developments in several capitals yesterday suggested that 16 days after President Bush announced a cease-fire, the danger of renewed fighting remains. The situation in Iraq is volatile, with Iraqi forces reportedly making significant inroads against rebellious Shiite Muslims in the south but facing stiffer resistance from Kurdish guerrillas in the north.

In Washington, a senior U.S. analyst described Iraqi President Saddam Hussein as "walking on a knife edge" in the fighting, in which the army may gain the upper hand on a given day, only to lose it the next day to rebel forces. They said Kurdish rebels, who appear to be better organized than the Shiites in the south, have gained control of a "wide swath" of northern Iraq, although those rebels have yet to take over any major cities.

The written warning by Gen. H. Norman Schwarzkopf to Iraq's ruling Revolutionary Command Council came in reply to a letter from the council notifying allied commanders that Iraq intended to regroup its dormant air force within the country, a senior Pentagon official said last night.

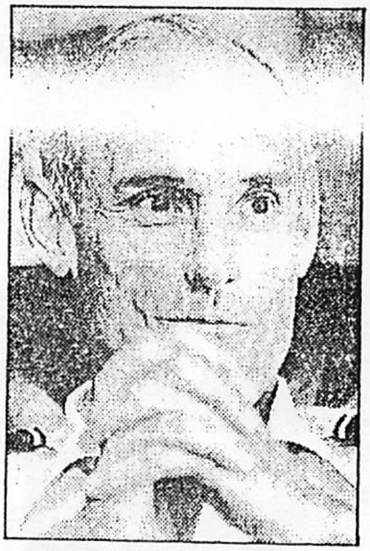
"They said they intended to fly some aircraft to various locations," the official said. "They didn't say

See IRAQ, A18, Col. 1

U.S. Bombs
Missed 70%
Of Time

'Smart' Munitions Far More Accurate

By Barton Gellman
Washington Post Staff Writer



GEN. MERRILL A. McPEAK
. . . a new portrait of the air war

Precision-guided bombs, the icon of Pentagon briefings and the military's preferred image of the Persian Gulf War, made up barely 7 percent of the U.S. tonnage dropped on Iraqi targets, Air Force Gen. Merrill A. McPeak disclosed yesterday.

McPeak's remarks, coupled with new details on the accuracy of unguided bombs from a senior Pentagon official, added up to this startling picture of the air war: of 88,500 tons of bombs dropped on Iraq and occupied Kuwait, 70 percent missed their targets.

The Air Force chief of staff did not call yesterday's briefing to talk about the misses. With budget season in full swing and the Pentagon's five-year restructuring now uppermost in his mind, McPeak made his first major postwar appearance "to tell an American success story" and claim the lion's share of credit for the rout of Iraqi forces in Kuwait.

Though careful to note that "all the services made a very important contribution" and to pay homage to the ground and sea campaigns, McPeak added, "My private conviction is that this is the first time in history that a field army has been defeated by air power."

Few independent analysts doubt that Iraq's stunning collapse after 43 days of war was due in large part to the most intense aerial bombardment in history. McPeak laid out the air campaign in new detail, with so relentless an emphasis on success that his list of lessons learned in the war suggested the Air Force already had known them all.

Among his most notable disclosures, however, was that laser-guided "smart" weapons, so indispensable to the military and political strategies of the air war, accounted for only 6,520 of 88,500 tons of destructive force that U.S. planes dropped on Iraq and occupied Kuwait. McPeak said they hit their intended targets about 90 percent of the time.

A senior Pentagon official said the 81,980 tons of "dumb," or unguided, bombs had an accuracy of only about 25 percent. McPeak declined to specify the success rate of unguided bombs, but conceded after the briefing that they were "much less" accurate than their laser-guided counterparts.

Because far more unguided bombs were dropped than guided ones, and because the unguided bombs were far less

See BOMBING, A18, Col. 4

4 L.A. Police Officers Indicted

Videotaped Beating of Motorist Results in Felony Charges

By Jill Walker and Lou Cannon
Washington Post Staff Writers

LOS ANGELES, March 15—Four police officers, including a sergeant, were charged

police commissioners who would force Gates to step down or fire him outright.

But whether the city's power structure cares about Gates enough to save him in the face of widespread criticism from many com-

RAY LUSTIG—THE WASHINGTON POST

ny marking the sixth
March 16, 1985.

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Emerges From Air Force Briefing

accurate, the portrait that emerged yesterday contrasted sharply with the high-tech, never-miss image that the Pentagon carefully cultivated during the war.

Calculations based on the information provided by McPeak and the senior official suggested that 26,363 tons of bombs hit targets, and 62,137 tons missed.

In some ways, military analysts said, that bottom-line figure is misleading. Unguided bombs have been missing targets for as long as planes have been dropping them, and if anything was new about the gulf war it was the quantity of precision bombs used.

McPeak said Iraq absorbed half again as many precision bombs in 43 days as Vietnam did in eight years of war.

But equally misleading, analysts said, is the unfailing exactness portrayed in every gun camera videotape released publicly by military authorities.

Senior officers have said they viewed extensive footage of bombs that missed targets—or hit targets selected in error, such as the civilian building across the street from the Iraqi Interior Ministry—but the Pentagon has released none of the footage. McPeak brought new videotape to yesterday's briefing, and once again every bomb struck where it was aimed.

McPeak took pains to praise not only the combat weapons and air crews but the logisticians and transporters who helped move an enormous expeditionary force to the gulf.

He compared the effort to a Berlin airlift every six weeks and said it was the equivalent of moving every resident of Oklahoma City with their vehicles, food and household goods.

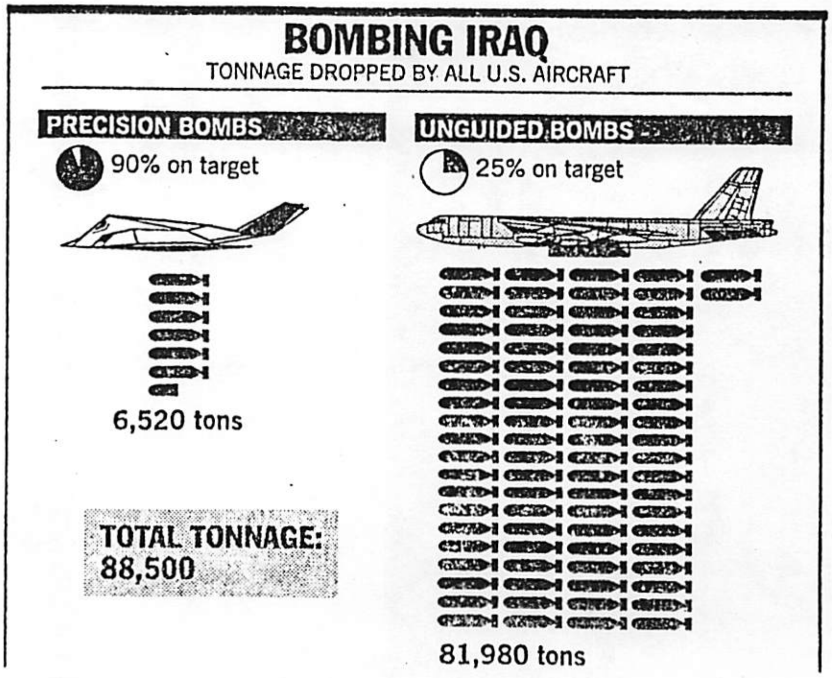
"This was certainly the largest airlift in history," he said. "We moved an army halfway around the world and set it up from scratch."

It did not appear to be entirely coincidental that the Air Force also chose yesterday to release a 22-page "perspective" paper making the case for the C-17, the next-generation transport plane on the Pentagon's shopping list.

Growing cost estimates have given some members of Congress qualms about the plane, but it is a top-priority acquisition for the Army and Air Force.

SYGMA

Aerial photo demonstrates precision bombing by French fighters of a camp of the Iraqi Republican Guard south of Basra. Black spots show hit on a target.



before when they were
was true. We were free."

Aircraft

been crossing the border
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ecent days.
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f the Mujaheddin report.
icials said there is evi-
oradic raids into Iraq by
ps from Iran, but Wash-
not yet convinced that
vernment forces are in-

not confirm that this is in
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," said one official, who
to be identified. "That
an it isn't so, but we ha-
it yet."
U.S. analyst said the
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g" the insurgency.
dad, the official media
n would make an "impor-
ic speech to the nation
vould be Saddam's first
the nation since the re-
oted.
outhern Iraq this week,
ilitary said a U.S. Black-
opter crashed, killing six
, the U.S. military said
n Dhahran, Saudi Arabia.
r American servicemen
rted killed yesterday,
324 the total U.S. losses
ington first sent forces
sian Gulf after Iraq's in-
uwait Aug. 2.
. Central Command said
of a UH-60V Blackhawk
missing since Tuesday,
Thursday in Iraq.
ccupants aboard the air-
killed," a Central Com-
ment said. It did not give
ut said the crash was an
said the helicopter be-
e 36th Medical Detach-
Medical Brigade.
ntral Command said a
igned to the 34th signal
vas found dead Tuesday
t wound. A second sol-
uesday when his five-ton
urned. An Air Force ser-
o his death at a Dubai
esday, it said.

nan reported from
rton Gellman from
. Correspondent
Randal contributed to
rom Damascus, and
George Lardner
from Washington.

top-priority acquisition for the Army and Air Force.

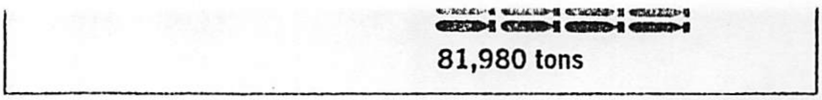
In a week when senior Pentagon [illegible]

Army National Guard, McPeak also singled out the performance of guard and reserve combat pilots from New York, South Carolina and Louisiana. He said it is easier to maintain combat readiness among Air Force reserves because many of the combat pilots also fly as civilians.

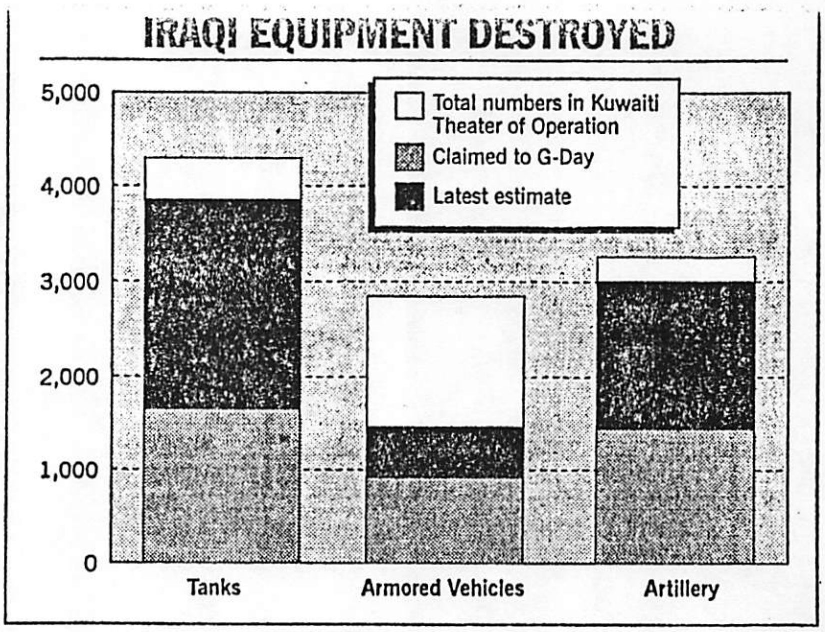
McPeak defended the decision of allied air forces to descend upon an Iraqi convoy fleeing Kuwait City in the final days of the war on a northern artery that became known as the Highway of Death. Scores of Iraqis were killed there and hundreds of vehicles destroyed in the panicky retreat toward the Iraqi border.

"When enemy armies are defeated, they retreat, often in disorder, and we have what is known in the business as the exploitation phase," McPeak said. "It's during this phase that the true fruits of victory are achieved from combat."

McPeak said a general's obligation is to his troops, and that "often causes us to do very brutal things. That's the nature of war."



THE WASHINGTON POST



THE WASHINGTON POST

The air campaign against Iraq was designed in four phases, he said, with the first three intended to last 30 days and set the stage for the ground war.

Allied commanders changed the plan—McPeak likened the process to a quarterback calling audibles—because the weather was the worst ever recorded in the gulf, the "great Scud chase" took up more resources than expected and Gen. H. Norman Schwarzkopf, commander of the allied forces, wanted to merge the three phases. Schwarzkopf launched the ground war nine days later than planned.

U.S. Visitors Shocked by Kuwait Horror Tour

KUWAIT, From A15

If the oil-field fires affected the senses, a subsequent visit to one of the Iraqi occupation force's torture centers stirred the emotions. At a palatial house belonging to a cousin of Saud Nasir Sabah, Kuwait's ambassador to the United States, members of the delegation appeared awed by the transformation of mundane tools and appliances into instruments of horror.

On a wall hung color photos of bodies found in a morgue after Kuwait's liberation. All bore signs of torture.

A guide pointed out a power drill that he said was used to bore holes in skulls and flesh. There were devices used to administer electric shocks, a saw covered with dried blood, a plane and metal claws used to scrape off skin, a clamp-like pair of pliers employed to pull out fingernails, salt to pour on wounds.

Blood-stained truncheons, hammers and a meat cleaver also were in evidence, along with a broken soda bottle that guides said prisoners had been forced to sit on.

"You could see the blood on the floor," Schaefer said.

Dornan said that if Americans were exposed to the oil-field devastation and the horrible details of Iraqi torture in Kuwait, "I think President Bush could do whatever he wanted" in pursuing Saddam. U.S. forces "could hunt him down like the mad animal he is," Dornan added.

Tony Coelho, a former Democrat congressman and now an investment banker in New York, said, "I can't imagine this guy remaining alive and unpunished. I think he deserves some more attention, and I hope he gets it." He said he hoped Arab countries would pursue war-criminal proceedings against Saddam.

Former ambassador to the United Nations and Atlanta mayor Andrew Young also expressed support for efforts to press charges against the Iraqi leader. "It's worse than criminal," he said of Iraqi behavior in Kuwait. "It's savage."

Schaefer said he had offered Kuwait help in setting up a medical facility and 2,000 temporary housing units, and had given Kuwaiti Ambassador Sabah a book listing Maryland companies with services to offer.

Among more than a dozen U.S. companies represented on the delegation were construction contractors such as Fluor and Brown and Root, telecommunications firms such as Bell Atlantic and AT&T and heavy-equipment manufacturers such as Caterpillar.

In a meeting between the delegation and Crown Prince Saad Abdullah Sabah, Mosbacher made clear that U.S. firms wanted to be involved in what promises to be a lucrative, multibillion-dollar reconstruction effort.

"We want to be, and will be, major partners with you in peace as we were in war," the commerce secretary said.

In Washington, Sen. Carl Levin (D-Mich.) said a letter signed by 82 senators urging Kuwait to end its participation in an Arab boycott of American companies that do business with Israel will be delivered to the emir or crown prince Saturday by a visiting Senate delegation.

drawn.

☐ **5.** Lifting of U.N. Security Council resolutions against Iraq after full withdrawal of Iraqi forces.

☐ **6.** Release of all prisoners of war immediately following a cease-fire.

☐ **7.** Withdrawal of forces to be monitored by noncombatant states named by the U.N. Security Council.

☐ **8.** Final details being worked out early today will be presented to U.N. Security Council members in New York.

"victory" for peace and saying a ground war less likely. France said it was a hard packag resist.

The announcement in Moscow that Iraq w withdraw its forces from Kuwait came just h after a number of Western leaders had pressed disappointment and anger at a def speech given by Saddam in which the Iraqi le rejected the idea of surrender to the U.S. coalition opposing him.

The Iraqi acceptance of the Soviet plan, w President Bush had said this week did not go enough to meet U.N. resolutions demanding Iraqi withdrawal from Kuwait, did not appare take Western leaders completely by surpr Bush and French President Francois Mitterr

Many Bombs May Have Missed

Munitions Used Against Iraq Aren't All as 'Smart' as Those on TV

By R. Jeffrey Smith
and Evelyn Richards
Washington Post Staff Writers

Accuracy

Preliminary estimates of the accuracy of U.S. bombs dropped on military targets in Iraq and Kuwait suggest that hundreds of precision-guided munitions, as well as thousands of "dumb" bombs, have missed their targets and in some cases struck unintended sites, according to U.S. officials.

These accidents involved a minority of the tens of thousands of tons of bombs that have been dropped in allied air operations that have achieved an overall level of bombing accuracy in the Persian Gulf War that exceeds the Pentagon's pre-war expectations and the record of bombing accuracy in previous wars. But U.S. officials so far only have disclosed anecdotal evidence of perfect bomb strikes.

A total of 110 million to 120 million pounds of explosives have been dropped on targets in Iraq and Kuwait during the past five weeks, a senior Pentagon official said—an amount that may equal approximately 150,000 individual weapons, according to several experts familiar with the U.S. munitions being used.

Estimated bombing accuracy rates in the Persian Gulf War have been as high as 95 percent for the most advanced types of U.S. guided munitions but lower than 50 percent for many unguided munitions, several officials said. Given the furious pace of combat in the gulf, even the relatively high success rates mean many failures, the officials said.

British officials this week highlighted the occasional tendency of so-called "smart" bombs to go astray and cause collateral—or civilian—damage when they disclosed that a laser-guided bomb had missed its target last week and struck a populated area in the Iraqi town of Fallujah.

In contrast, U.S. defense officials—over the objections of senior Air Force officials—have suppressed a film showing a U.S. smart bomb early in the war accidentally striking a civilian building in downtown Baghdad, across from the Interior Ministry.

Several Pentagon officials, speaking on condition they not be named, said unguided munitions frequently have missed such military targets as bridges or armored revetments, a circumstance that delayed successful prosecution of the air war against Republican Guard forces around the Iraqi-Kuwaiti border.

Independent analysts also note that the allied coalition has been using several types of munitions with poor accuracy records in past conflicts and poor operational test results, including at least one type of guided bomb found to be so inaccurate that its production was halted abruptly six years ago.

See BOMBS, A26, Col. 1

Technici

My, it's amazing how time flies. It was only last w
Georgetowne, Britches Great Outdo
for Women are having a CONSOLID
All those clothes you wanted. 30
We told you that you'll save
Still hazy? Maybe this will jog your memory. Save

that Saddam "repeats the same invective and disregard for the United Nations mandate that we have heard so often since Aug. 2."

Congressional reaction to the Soviet-Iraqi plan was cautious. Several senators welcomed the proposal but warned that the United States would probably insist on modifications.

"I think it would be foolish to say size and devastating firepower that an attack is likely to take under U.S. doctrine, Kelly added: "I can guarantee you will know it when you see it. And it won't be patrols."

Three Scud missiles launched at King Khalid Military City in northern Saudi Arabia were intercepted by Patriot missiles and reportedly caused no damage, U.S. officials said. Last night, air raid sirens

An Army OH-58 helicopter was lost on a night mission and both pilots were killed. An Air Force F-16 returning from a mission over Iraq experienced engine failure during mid-air refueling; the pilot ejected and was rescued. Also, a Marine Chinook helicopter made a crash landing and was declared "not repairable," Neal added.

Sporadic border skirmishes con-

Saddam in several Iraqi cities, Tutwiler said, although she declined to provide any details.

In other combat action, British bombers again attacked airfields and Iraqi artillery positions. Sixty percent of Iraq's hardened aircraft shelters have been destroyed now, according to Group Capt. Niall Irving of the Royal Air Force. Noting the successful destruction of an

military encirclement by the West
The sympathy felt by sections
the military in favor of Soviet di
lomatic support for Saddam's r
gime was reflected in a first-pers
account in the conservative dai
Sovietskaya Rossiya, by a Sovi
general who accompanied Aziz
his last trip from Moscow to Bag
dad. Maj. Gen. Viktor Filatov co
pared the allied bombardment

Hundreds of Allied Bombs Are Likely to Have Missed I

BOMBS, From A25

Although the Pentagon has declined to release a detailed tally of the munitions used to date, several officials said the smart bombs featured in the videotapes that have been shown during military briefings represent only 5 to 10 percent of the total. The rest have been simple steel-encased explosives—including some with designs dating from World War II—that follow unguided, ballistic trajectories to their targets, usually hitting within 50 to 100 feet but sometimes missing by much greater distances.

A potentially wide margin of error in allied bombing was illustrated Monday when U.S. military officials in Washington, seeking to rebut Iraqi claims that a bomb had struck a mosque in Basra, said that while the bomb had missed the mosque, it fell a half-mile from the military command center it was supposed to hit.

A senior U.S. military official in Washington who has seen both still and video pictures of damage from inaccurate bombing said that more bombs have missed their targets in Iraq and Kuwait than political leaders have wanted to admit. But he said it may not be until after the war that a comprehensive estimate of weapons' accuracy can be drawn from a detailed inventory of munitions used in the fighting and associated bomb damage.

"You see pictures all the time of near-misses of [Iraqi armored and troop] revetments and so forth," said another Pentagon official with access to bomb damage reports.

A gap between the promise and performance of guided munitions in warfare was demonstrated during the 1986 U.S. raid on Libyan targets, according to several sources. After Air Force and Navy planes released scores of bombs like those being used in Operation Desert Storm, a Pentagon spokesman announced that the raid was "an absolutely flawless professional performance .... We hit what we aimed at."

That claim was illustrated at the time by videotapes of smart bombs striking Libyan command centers and military barracks. But a different story about the Libya raid was later told in two classified government studies, which said that the GBU-10 laser-guided bombs dropped by eight F-111 aircraft hit fewer of their targets than so-called "dumb" bombs dropped by five other such aircraft.

At least one of the GBU-10s accidentally struck a residential neighborhood near the French Embassy in downtown Tripoli and others missed a Libyan training center and leader Moammar Gadhafi's house, having lost their laser tracks due to such commonplace factors as weather and unusually abrupt aircraft manuevers. The 2,000-pound munition is being used by F-111s and other aircraft in Iraq.

The studies also revealed that fewer than 10 of the more than 40 Harm and Shrike missiles fired by F-18 and A-7 aircraft actually struck targeted radars in Libya. The Navy claimed that use of the missiles was nonetheless a success, because the Libyans were forced to turn off some of their radars to avoid destruction. But the missiles then followed an unguided trajectory and hit unintended sites; at least one may have been recovered from the desert by the Libyans and turned over to the Soviet Union.

"If your car started as often as these munitions worked, you would not think you had a reliable car," said a source who has read the reports and disputes the Navy's assertion of success. Both anti-radiation missiles have been extensively used in Iraq and Kuwait.

The GBU-27, a 2,000 pound laser-guided bomb dropped solely from the Air Force's F-117 "stealth" aircraft, has, in contrast, been one of the success stories of the past four weeks, according to Lt. Gen. Charles Horner, commander of allied air forces in the gulf war.

Two such bombs were used in a pinpoint strike on the Baghdad building targeted last week as an Iraqi military communications center, which later appeared to have been sheltering hundreds of civilians killed in the attack. The GBU-27 also was used effectively in nighttime raids on scores of Iraqi aircraft shelters, which Western officials believe caused the Iraqis to transfer more than 120 combat planes to Iran.

A senior official familiar with the raids said their high success rate was due to a special guidance mechanism in each GBU-27 that contributes also to the bomb's high cost—roughly $100,000, compared to an average of $50,000 for a less sophisticated precision-guided munition. Moreover, each "stealth" fighter carries top-of-the-line night-vision equipment and an unusually stable laser designator, capable of remaining fixed on a target even during extreme aircraft maneuvers.

Officials say a cheaper 2,000-pound laser-guided bomb, the GBU-24, has been dropped by at least four different types of U.S. aircraft on Iraqi targets despite earning low marks for accuracy during its development in the early 1980's. The GBU-24 was designed for release at low altitudes. But according to two former defense officials familiar with the bomb's history, its poor accuracy rate and mushrooming cost were the chief reasons that production of the weapon was canceled by the Air Force in 1985 after only 5,000 to 6,000 of a projected 70,000 bombs were made.

In a 1985 presentation to the Defense Science Board, Pentagon officials reported that a low-level laser-guided bomb had achieved 20 target hits out of 39 aircraft drops in realistic operational tests, the final step before beginning full-scale production. The infrared-guided GBU-15, a 2,000-pound munition, had achieved five hits out of 10 drops, and the infrared Maverick anti-tank missile was said to have achieved eight hits out of 12 launches, the officials reported. Both the Maverick and GBU-15 are being used in Iraq.

Former Navy Secretary John Lehman said that laser-guided bombs historically have come within 10 feet of their intended target about 60 percent of the time, although a senior defense official said he believes this estimate understates their actual record during the gulf war. "Operational testing can include mistakes due to poor training or weapons bugs that get fixed later," the official said.

Iraq

Official name: al-Jumhūrīyah al-'Irāqīyah (Republic of Iraq).
Form of government: unitary single-party republic with one legislative house (National Assembly [250]).
Head of state and government: President.
Capital: Baghdād.
Official language: Arabic.
Official religion: Islam.
Monetary unit: 1 Iraqi dinar (ID) = 20 dirhams = 1,000 fils; valuation (Oct. 10, 1988) 1 ID = U.S.$3.22; 1 ID = £1.89.

Area and population

		area[1]		population
Governorates	**Capitals**	sq mi	sq km	1986 estimate
al-Anbār	ar-Ramādi	53,175	137,723	598,000
Bābil	al-Ḥillah	2,030	5,258	759,000
Baghdād	Baghdād	1,992	5,159	4,868,000
al-Baṣrah	Basra	~~7,363~~	~~19,070~~	~~1,346,000~~
Dhi Qār	an-Nāṣiriyah	5,261	13,626	741,000
Diyālā	Ba'qūbah	7,449	19,292	706,000
Karbalā'	Karbalā'	1,944	5,034	337,000
Maysān	al-'Amārah	5,445	14,103	417,000
al-Muthannā	as-Samāwah	19,702	51,029	259,000
an-Najaf	an-Najaf	10,751	27,844	484,000
Ninawā	Mosul	14,555	37,698	1,393,000
al-Qādisiyah	ad-Diwāniyah	3,285	8,507	524,000
Ṣalāḥ ad-Din	Sāmarrā'	11,198	29,004	454,000
at-Ta'mim	Kirkūk	4,012	10,391	674,000
Wasiṭ	al-Kūt	6,683	17,308	494,000
Kurdish Autonomous Region				
Dahūk	Dahūk	2,363	6,120	343,000
Irbil	Irbil	5,587	14,471	774,000
as-Sulaymāniyah	as-Sulaymāniyah	6,083	15,756	939,000
LAND AREA		168,878	437,393	16,110,000
INLAND WATER		357	924	
TOTAL AREA		169,235	438,317	

'86

'90

465.9

3,485,398

Demography

Population (1988): 16,630,000.
Density[2] (1988): persons per sq mi 98.5, persons per sq km 38.0.
Urban-rural (1986): urban 72.2%; rural 27.8%.
Sex distribution (1987): male 51.39%; female 48.61%.
Age breakdown (1986): under 15, 45.3%; 15–29, 28.4%; 30–44, 13.6%; 45–59, 7.6%; 60–74, 3.8%; 75 and over, 1.3%.
Population projection: (1990) 17,676,000; (2000) 23,801,000.
Doubling time: 23 years.
Ethnic composition (1983): Arab 77.1%; Kurd 19.0%; Turkmen 1.4%; Persian 0.8%; Assyrian 0.8%; other 0.9%.
Religious affiliation (1980): Muslim 95.8% (of which Shī'ī 53.5%, Sunnī 42.3%); Christian 3.5%; other 0.7%.
Major cities (1985): Baghdād 4,648,609; Basra 616,700; Mosul 570,926; Irbil 333,903; as-Sulaymanīyah 279,424.

Vital statistics

Birth rate per 1,000 population (1986): 45.1 (world avg. 26.0).
Death rate per 1,000 population (1986): 8.6 (world avg. 9.9).
Natural increase rate per 1,000 population (1986): 36.5 (world avg. 16.1).
Total fertility rate (avg. births per childbearing woman; 1986): 7.1.
Marriage rate per 1,000 population (1982): 4.0.
Divorce rate per 1,000 population (1981): 0.1.
Life expectancy at birth (1986): male 61.0 years; female 64.5 years.
Major causes of death per 100,000 population (1975): heart disease (except ischemic) 69.9; accidents (all types) 27.6; pneumonia 27.2; malignant neoplasms (cancers) 19.6; during the 1980s, however, there were high war casualties and high incidence of trachoma, influenza, measles, whooping cough, and tuberculosis.

National economy

Budget (1982). Revenue: ID 8,740,000,000 (1981; revenue from oil and public enterprises 88.5%, sales tax 7.7%, income tax 1.3%). Expenditures: ID 8,740,000,000 (1981; economic services 44.9%, defense 24.0%, local government 8.3%, internal security 5.2%, health 4.6%, education 2.9%).
Public debt (external, outstanding; 1986): U.S.$50,500,000,000.
Production (metric tons except as noted). Agriculture, forestry, fishing (1986): barley 1,046,000, wheat 1,036,000, watermelons 551,000, tomatoes 523,000, grapes 440,000, dates 434,000, cucumbers and gherkins 368,000, melons 356,000, green beans 236,000, oranges 160,000, eggplants 150,000, potatoes 120,000; livestock (number of live animals) 8,800,000 sheep, 2,400,000 goats, 1,573,000 cattle, 900,000 mules and asses, 150,000 buffalo, 60,000 camels, 75,000,000 chickens; roundwood 143,000 cu m; fish catch 20,564. Mining and quarrying (1986): elemental sulfur 600,000; gypsum 300,000. Manufacturing (1981): cement 8,000,000[3]; vegetable oil 109,230; toilet soap 7,062; woolen cloth 2,906 m; beer 6,693,900 hectolitres; shoes 7,334,000 pairs; matches 540,720,000 units; cigarettes 7,700,000 units. Construction (1985): authorized residential 11,521,000 sq m; authorized nonresidential 1,176,000 sq m. Energy production (consumption): electricity (kW-hr; 1986) 18,850,000,000 (18,850,000,000); coal, none (n.a.); crude petroleum (barrels; 1986) 603,352,000 (109,500,000); petroleum products (metric tons; 1986) 12,045,000 (7,025,000); natural gas (cu m; 1986) 565,844,000 (565,844,000).
Tourism (1986): receipts from visitors U.S.$100,000,000; expenditures by nationals abroad, n.a.
Gross national product (1985): U.S.$37,930,000,000 (U.S.$2,330 per capita).

Structure of gross domestic product and labour force

	1985		1986	
	in value ID '000,000	% of total value	labour force	% of labour force
Agriculture	2,265.8	15.6	1,193,170	27.7
Mining	3,596.4	24.7	62,096	1.4
Manufacturing	1,416.2	9.7	386,809	9.0
Construction	1,094.6	7.5	521,013	12.1
Public utilities	172.4	1.2	34,179	0.8
Transp. and commun.	783.0	5.4	260,237	6.0
Trade	1,597.6	11.0	329,704	7.7
Finance	3,620.8	24.9	50,043	1.2
Pub. admin., defense			1,470,090	34.1
Services				
Other			—	—
TOTAL	14,546.8	100.0	4,307,341	100.0

Population economically active (1986): total 4,307,341; activity rate of total population 26.9% (participation rates: over age 15, 50.6%; female 18.2%; unemployed [1984] 0.9%).

Price and earnings indexes (1980 = 100)

	1980	1981	1982	1983	1984
Consumer price index	100.0	110.6	135.2	151.4	168.5
Earnings index	...	...	...	...	...

Household income and expenditure. Average household size (1986) 7.8; income per household: n.a.; sources of income: n.a.; expenditure (1971–72): food 55.4%, clothing 10.3%, housing 7.9%, household goods 6.2%, transp. and commun. 5.3%, energy 4.1%, medical care 2.4%, recreation 1.2%.
Land use (1985): forested 4.4%; meadows and pastures 9.2%; agricultural and under permanent cultivation 12.5%; built-on, wasteland, and other 73.9%.

Foreign trade[4]

Balance of trade (current prices)

	1982	1983	1984	1985	1986	1987
ID '000,000	−11,304	−2,381	+282	+966	−1,124	+2,006
% of total	35.6%	10.8%	1.3%	4.4%	6.9%	12.5%

Imports (1985): U.S.$10,534,000,000 (machinery and transport equipment 30.6%; food and agricultural raw materials 24.3%; chemical and pharmaceutical products 7.2%). *Major import sources* (1987): Turkey 14.8%; United States 10.7%; West Germany 7.3%; U.K. 7.0%; Japan 6.2%; France 5.8%; Brazil 5.2%; Yugoslavia 4.6%; Romania 4.6%; Italy 4.1%.
Exports (1985): U.S.$11,500,000,000 (fuels and other energy 99.6%; food and agricultural raw materials 0.4%). *Major export destinations* (1987): Brazil 16.5%; Italy 12.2%; France 10.2%; Turkey 7.5%; Japan 6.9%; Spain 6.7%; Yugoslavia 6.4%; United States 5.3%; West Germany 4.1%.

Transport and communications

Transport. Railroads (1986): route length (1987) 1,516 mi, 2,439 km; passenger-mi 624,000,000, passenger-km 1,005,000,000; short ton-mi cargo 886,000,000, metric ton-km cargo 1,294,000,000. Roads (1986): total length 20,653 mi, 33,238 km (paved 72%). Vehicles (1986): passenger cars 491,800; trucks and buses 246,700. Merchant marine (1987): vessels (100 gross tons and over) 142; total deadweight tonnage 1,683,083. Air transport (1984): passenger-mi 746,000,000, passenger-km 1,200,000,000; short ton-mi cargo 36,000,000, metric ton-km cargo 52,000,000; airports (1988) with scheduled flights 3.
Communications. Daily newspapers (1987): total number 6; total circulation 328,000; circulation per 1,000 population 21. Radio (1986): 2,800,000 receivers (1 per 5.6 persons). Television (1986): 605,000 receivers (1 per 26 persons). Telephones (1985): 886,133 (1 per 17 persons).

Education and health

Education (1986–87)

	schools	teachers	students	student/ teacher ratio
Primary (age 6–11)	8,210	123,310	2,920,959	23.7
Secondary (age 12–17)	2,315	39,261	1,012,426	25.8
Voc., teacher tr.	228	9,198	166,335	18.1
Higher	25	8,327	142,495	17.1

Educational attainment, n.a. *Literacy* (1984): total population age 15 and over literate 2,815,895 (45.9%); males literate 2,034,011 (65.9%); females literate 781,884 (26.0%).
Health (1984): physicians 4,428 (1 per 3,324 persons); hospital beds 26,657 (1 per 552 persons); infant mortality rate per 1,000 live births (1986) 63.3.
Food (1983–85): daily per capita caloric intake 2,901 (vegetable products 88%, animal products 12%); (1983) 121% of FAO recommended minimum.

Military

Total active duty personnel (1988): 1,000,000 (army 95.5%, navy 0.5%, air force 4.0%). *Military expenditure as percent of GNP* (1984): 42.5% (world 5.9%); per capita expenditure U.S.$1,080.

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[1] Excluding Iraq–Saudi Arabia Neutral Zone. [2] Based on land area only. [3] 1986. [4] Balance of trade is based on f.o.b. valuation of imports and exports; however, commodities traded and trade partners information are based on c.i.f.

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Mk 82 BOMB

Type

Low drag 227 kg (500 lb) general-purpose bomb.

Development

The Mk 82 bomb was developed in the 1950s as one of a range of low drag general-purpose bombs for use by the US Air Force and US Navy on high speed aircraft. It is a standard design adopted by many bomb producing countries throughout the world.

Description

The Mk 82 bomb has a long, slender, aerodynamically shaped body giving a low drag profile making it suitable for external and internal carriage and release by high speed aircraft. The bomb has the facility for both nose and tail fuzing and either proximity, mechanical or electrical fuzes can be employed. The tail unit has four fixed fins to provide stability and this unit is bolted to the rear of the main bomb body.

Internally, passing through the explosive charge are two conduits for the electrical fuze harness, needed for electrical fuzing, connecting the nose and tail fuze cavities with a charging receptable situated between the two suspension lugs on the outer skin of the bomb casing. The two suspension lugs are spaced either 356 or 762 mm apart. The explosive filling is either Tritonal or H-6.

The bomb has been manufactured in the US to several modification standards but in general these modifications have been of a relatively minor nature. The bomb casing has also been adapted as a seabed mine for anti-submarine or anti-shipping use as part of the Quickstrike programme of weapons using a different explosive filling and different fuzing systems.

The Mk 82 bomb usually employs the M904 (nose), M905 (tail) or FMU-113 air-burst fuzes. The bomb has been cleared for use on the following current range of aircraft: A-7, A-10, A-37, B-52, F-4, F-5, F-16, F-111, FB-111 and OV-10.

To provide safe separation at low altitude release, the Mk 82 bomb can be fitted with either a Mk 15 (Snakeye) or a BSU-54 retarded tail. The Mk 15 uses four metal flip out retarding blades whereas the BSU-54 has a balloon type retarder. The Mk 15 tail has been cleared for all the previously mentioned aircraft whereas the BSU-54 has only been cleared on the A-7, F-4 and F-111 aircraft. When fitted with a retarding tail the Mk 82 bomb is re-designated the Mk 82 RE GP Bomb. In this configuration it usually only employs the M904 (nose) or FMU-54 tail fuzes.

For the US Navy there is a Product Improvement Initiative programme which entails fitting the Mk 82 with the less sensitive explosive PBXN-109. When so filled the Mk 82 bomb will be re-designated BLU-111/B.

Operational Status

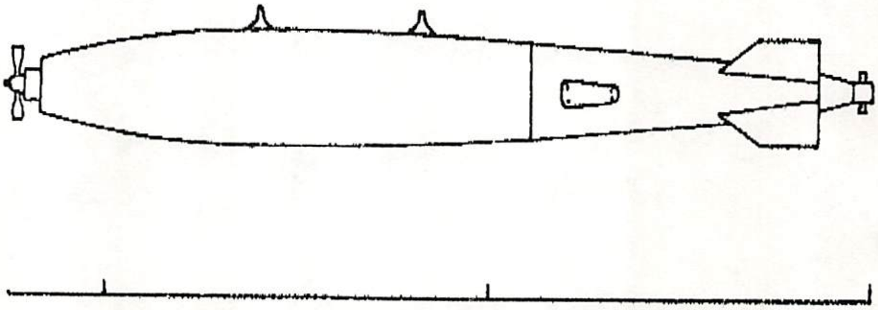
In production and in service with US Air Force, US Navy and several other countries worldwide. Fiscal Year 1990 procurement for the US Navy will include 12 000 Mk 82, H-6 filled bombs.

Specifications

Mk 82 Mod 1
Length: 2.21 m
Body diameter: 273 mm
Tailspan: 383 mm
Weight: 241 kg
Filling: 87 kg Tritonal, Minol or H-6
Lug spacing: 356 mm or 762 mm

Contractor

Not known.



11.16

Mk 84 BOMB

Type

Low drag 908 kg (2000 lb) bomb.

Development

The Mk 84 bomb was developed in the 1950s as one of a range of low drag general-purpose bombs for use by the US Air Force and US Navy on high speed aircraft. It is a design adopted by several bomb producing countries throughout the world.

Description

The Mk 84 bomb has a long slender aerodynamically shaped body giving a low drag profile making it suitable for external and internal carriage and release by high speed aircraft. The bomb has the facility for both nose and tail fuzing and either proximity, mechanical or electrical fuzes can be employed. The tail unit has four fixed fins for stability and the unit is bolted to the rear of the main bomb body.

Internally, passing through the explosive charge are two conduits for the electrical fuze harness needed for electrical fuzing, connecting the nose and tail fuze cavities with a charging receptable situated between the two suspension lugs on the outer skin of the bomb casing. The two suspension lugs are spaced 762 mm apart. The explosive filling is either Tritonal or H-6.

The bomb has been manufactured in the US to several modification standards but in general these modifications have been of a relatively minor nature. The bomb casing has also been adapted as a seabed mine for anti-submarine or anti-shipping use as part of the Quickstrike weapons programme using a different explosive filling and different fuzing systems.

The Mk 84 bomb usually employs the M904 (nose), M905 (tail) or FMU-113 (air-burst) fuzes. The bomb has been cleared for use by A-7, A-10, B-52, F-4, F-5, F-16, and F-111 aircraft of the USAF.

To provide safe separation at low altitude release, the Mk 84 bomb can be fitted with a BSU-50 retarded tail. This is a balloon type retarder which has been cleared for use by all the previous mentioned aircraft. When fitted with this BSU-50 tail unit, the bomb is re-designated the Mk 84 RE GP bomb.

Operational Status

In service with the US Air Force, US Navy and several other countries worldwide.

Specifications

Mk 84 Mod 1

Length: 3.84 mm

Body diameter: 460 mm

Tailspan: 642 mm

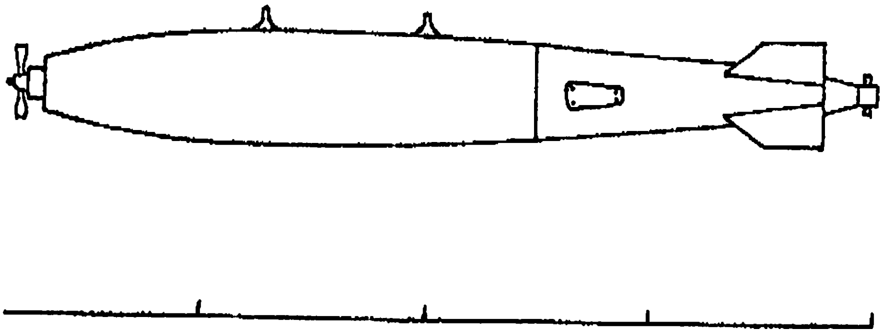
Weight: 894 kg

Filling: 428 kg Tritonal or H-6

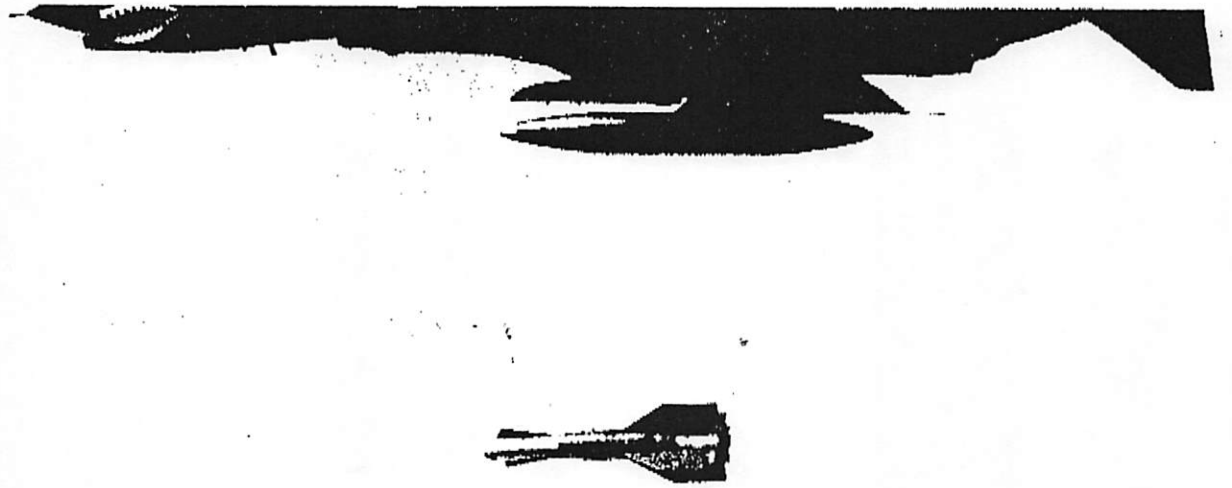
Lug spacing: 762 mm

Contractor

Not known.



GBU-15 GLIDE BOMB



A GBU-15 modular glide bomb leaves a USAF F-4E Phantom

Type

Modular glide bomb.

Development

The GBU-15 was developed as a precision weapon system for attacking heavily defended targets. It was originally designed around the Mk 84 2000 lb GP bomb. Since 1975 over 100 TV and Infra-Red (IR)-guided weapons have been launched in operational tests and training with an overall success rate of more than 85 per cent.

Description

The major components of the GBU-15 are:

- (a) 2000 lb bomb body (Mk 84, BLU-109 or SUU-54)
- (b) Guidance module (DSU-27A/B TV seeker or WGU-10/B IR seeker)
- (c) Adaptor to join the guidance section to the bomb body (varies according to bomb shape)
- (d) Control module (WCU-8/B, contains battery, flight control sensors, autopilot and control surface actuators)
- (e) Weapon data link receiver/transmitter module
- (f) Cruciform airfoil group (consisting wings, strakes and control surfaces together with electrical conduit and umbilical).

As a modular system the GBU-15 is easily adaptable to evolving tactical requirements. The differing seeker/bomb options can respond to changing weather conditions and targeting needs. The GBU-15(V)1/B features a TV seeker for daylight attacks while the GBU-15(V)2/B uses the Imaging Infra-Red (IIR) seeker from the AGM-65D Maverick for night attack. These seeker modules are interchangeable and an integral part of the GBU-15 family of weapons. In addition to the basic Mk 84 bomb, the GBU-15 has been successfully demonstrated with the BLU-109 improved 2000 lb bomb for increased penetration against hardened targets. The GBU-15 is also compatible with the SUU-54 dispenser with its submunition capability of attacking over targets.

Two interchangeable airfoil groups have been produced for the GBU-15. The original is termed 'long chord wing' and comprises most of the existing inventory. However, current production is solely of the smaller 'short chord wing' which was introduced as a cost saving measure. Although it is about half the wing area of the original airfoil its low altitude performance is the same. The short chord wing is also lighter and stronger and is compatible with the AGM-130 weapon. Both airfoils use the same wing control surfaces and have the same wingspan but the new wing uses a different strake design

Required equipment for the GBU-15 control aircraft includes a compatible data link pod (such as the USAF AXQ-14), cockpit pod control, suitable E-O display and controls and a hand controller for the seeker. Video is transmitted continuously from the weapon to the aircraft; commands from aircraft to weapon are only transmitted when the weapon operator is slewing the seeker or commanding lock-on. This data link feature eliminates the need to lock-on before launch which allows blind launches at low altitude or extreme stand-off ranges as well as aim point corrections until shortly before target impact.

The GBU-15 is normally employed in the indirect attack mode where a weapon is launched towards the target without a lock-on. After launch the weapon performs a programmed G-bias climb and the operator acquires the target shortly afterwards. The operator then has the option to lock onto the aim point or manually track it. If a lock-on is taken, he can subsequently break lock to refine his aim point or transition to a manual track. In addtition to lock-on after launch mode, the GBU-15 has retained the direct attack (or lock on before launch) feature of the earlier GBU-8 HOBO weapon, allowing GBU-15 employment by aircraft having E-O capability but not a data link. Alternatively, GBU-15 may be used in the 'buddy' control mode, where one aircraft delivers the weapon and another performs the control functions (the delivery aircraft may or may not have a data link capability). The control aircraft can then take full advantage of the data link's transmissions range and can even be outside hostile airspace. Other tactics afforded by the data link include having one aircraft deliver two or more weapons on a single pass, with one weapon controlled by the delivery aircraft and the others by buddy aircraft located elsewhere. Each weapon must operate on a seperate frequency during multiple releases. Depending on launch speed and altitude GBU-15 has a range of 1.5 to 80 km.

Operational Status

In production. Since 1980 orders for 3200 weapon kits have been received for the US and Israeli Air Forces.

The GBU-15 system has been certified on the following aircraft: USAF F-4E, F-111F and B-52D; Royal Australian Air Force F-111C; Israeli F-15. Integration is under way with the USAF F-15E and B-52G and the Israeli F-16C/D aircraft.

Specifications

Used on Mk 84 bomb
Length: 3.94 m
Body diameter: 460 mm
Tailspan: 1.5 m
Weight: 1140 kg (with long chord wings)
Filling: HE
Lug spacing: 356 mm

Contractors

Rockwell International, Missile Systems Division, Duluth (prime contractor).

Hughes Aircraft Company, Missile Systems Group, Canoga Park (weapon data link and control pod contractor).

M117 GP BOMB

Type

High capacity 340 kg (750 lb) general-purpose bomb.

Development

Developed in the early 1960s as a high blast effect weapon for use by the US Air Force.

Description

This is a thin case cigar shaped bomb with a four fin tail unit (MAU-103) which is fitted to the rear of the main bomb body. It has both nose and tail fuze cavities and can use either mechanical or electrical fuzes. Like the Mk 80 family of bombs, the M117 has two internal conduits running through the explosive filling connecting the nose and tail fuze cavities to a charging receptacle situated between the two suspension lugs on the outer skin of the bomb, for electrical fuzing operations. The fuzes most widely used in this bomb are the M904 (nose) and M905 (tail). The explosive filling is either Tritonal or Minol. Currently the M117 bomb has been cleared for use on the A-7, A-37, B-52, F-4, F-5, F-111 and FB-111 aircraft.

A retarded version of the M117 is also available. This is the basic M117 bomb body fitted with a MAU-19 retarding tail. This latter configuration has been cleared for use on A-37, B-52, F-111 and OV-10 aircraft. With this retarder fitted the bomb is designated the M117R GP bomb and is used with the M904 (nose) and FMU-54 (tail) fuzes.

Operational Status

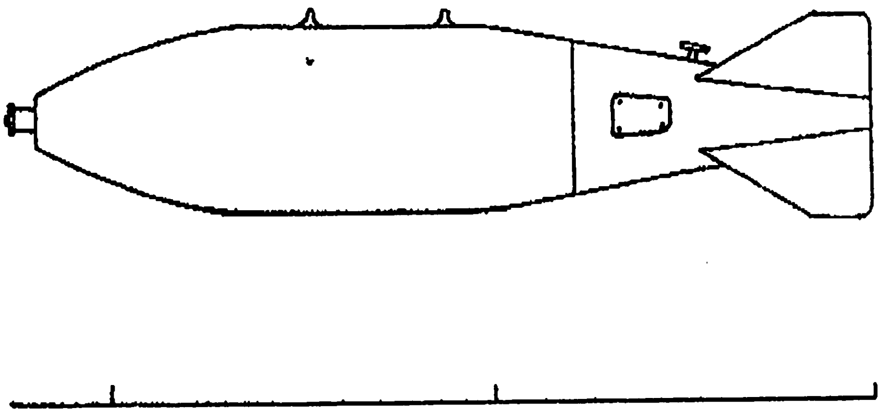
In service with the US Air Force.

Specifications

Length: 2.27 m
Body diameter: 409 mm
Tailspan: N/K
Weight: 373 kg
Filling: 175 kg Minol or Tritonal
Lug spacing: 356 mm

Contractor

Not known.



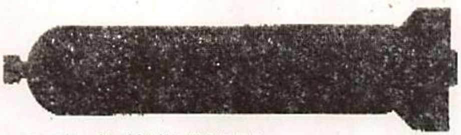
MUNITIONS USED IN THE AIR WAR

CBUs

Cluster Bomb Units (CBUs) are metal bombs filled with "bomblets." When a CBU is dropped from an airplane, the casing opens and the contents are scattered over the target area.

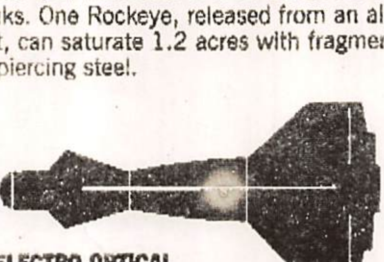
The CBU-89, for example, is a 700-lb. weapon that disperses anti-tank and anti-personnel bomblets. Bomblets become armed on impact, and serve as mines to keep vehicles and personnel out of the area.

Other weapons of this type used in Operation Desert Storm: CBU-87 and CBU-52/58/71.



ANTI-ARMOR CLUSTER BOMBS

Bombs of this type include the 476-lb. Rockeye, a weapon filled with hundreds of 2-lb. bomblets that destroy tanks. One Rockeye, released from an altitude of 500 feet, can saturate 1.2 acres with fragments of the armor-piercing steel.



INFRARED/ELECTRO-OPTICAL GUIDED BOMBS

Infrared and electro-optically guided bombs have been used repeatedly against Iraqi strategic sites. The GBU-15 uses a 2,000-lb. bomb that can be fitted with either guidance system.

When the infrared method is used, the bomb homes in on heat sources identified by the bombardier and programmed into the bomb's guidance package. When electro-optical guidance is used, the bomb carries a television camera in the nose and an antenna in the tail. The Weapons Systems Officer aboard the bomber flies the weapon to the target, "steering" it with a joystick.

A typical bomb of this type can blast away more than 8,500 cubic feet of material, leaving a hole the size of a large suburban swimming pool.

NOTE: Drawings not to scale.

LASER-GUIDED BOMBS

Aircraft deploying these weapons bounce a laser beam off the desired target. The bombs glide toward the target following the reflected beam. A bomb of this type is the GBU-10. The 2,000-lb. bomb detonates on impact, disintegrating a thick steel casing and releasing a charge created by 945 lbs. of high explosive material.

Other weapons of this type used in Operation Desert Storm: GBU-12, GBU-24 and GBU-27

AGMs

Air-to-Ground Missiles include such weapons as the High-speed Anti-Radiation Missile (HARM) weighing about 800 lbs. and carrying a high-explosive warhead.

Once dropped from an airplane, the missile flies at speeds exceeding Mach 3, homing in on the radar energy emitted from its target. Its 145-lb. warhead contains thousands of small metal cubes that spray out upon detonation to damage radar antennas and other fragile equipment.

Others weapons of this type used in Operation Desert Storm: AGM-45 (Shrike) and AGM-65 (Maverick).

GENERAL-PURPOSE BOMBS

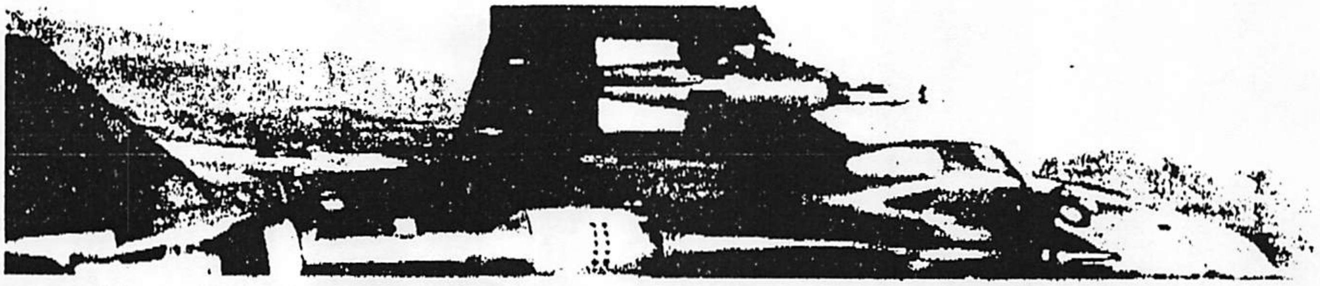
These conventional bombs have thick metal casings filled with explosive material to ensure penetration of a target. The MK-84 bomb of this type weighs 2,000 lbs. and can form a crater 50 feet in diameter and 36 feet deep. Depending on the altitude from which it is dropped, the bomb can penetrate 15 inches of metal or 11 feet of concrete and disperse shrapnel to a radius of 400 yards.

Other weapons of this type used in Operation Desert Storm: MK-82 and MK-117.

Compiled by James Schwartz—The Washington Post

BY PETER HOEY—THE WASHINGTON POST

PAVEWAY LASER-GUIDED BOMB



Paveway II laser-guided bomb underwing on UK RAF Jaguar GR1 inboard stations

Type

Modular glide bomb with laser guidance system.

Development

The USAF Armament Development and Test Centre (ADTC) Eglin AFB initiated a competitive evaluation of two laser guidance concepts for standard bombs in 1965. Following successful evaluation the Paveway programme office was established at Wright-Patterson AFB with Texas Instruments selected to develop and supply laser guidance kits for M117 GP bombs. Using the Texas Instruments guidance kits, two additional GP bombs (Mk 82 and Mk 84) and the M118 demolition bomb were adapted to laser guidance and operationally employed.

Paveway II was developed in the mid-1970s. This incorporated more advanced electronics and a folding wing aerofoil group which improved sensitivity and manoeuvrability. It also incorporated cost reduction features such as plastic lenses, plastic ringtail and integrated circuitry to improve reliability and reduce manufacturing time. The folding wings also permitted increased load density on delivery aircraft. A third generation LGB started development in 1980–81. Known as Paveway III, or Low Level Laser-Guided Bomb (LLLGB), it was developed to provide delivery at very low altitudes and significant stand-off ranges. This LLLGB incorporates updated microprocessor technology, high lift folding wings and an improved scanning seeker. Development was successfully completed by 1986 when the USAF dropped 47 LLLGBs from F-4 and F-111 aircraft scoring 44 successes.

Joint development between Texas Instruments, the Royal Aircraft Establishment and Portsmouth Aviation Ltd, UK, led to LGBs being introduced into the RAF with its Mk 13/18 1000 lb bombs.

Description

The family of Paveway laser-guided bombs uses a common laser guidance and control assembly with only the aerodynamic surfaces (control fins and aerofoil group) changed to match the particular bomb body.

The laser guidance kit fitted to the bomb directs the weapon towards the target which has been illuminated by laser energy from the delivery aircraft, a companion aircraft or a ground observer. The reflected laser energy detected by the bomb's laser guidance system processes the information, computes appropriate control commands and applies these commands to the aerofoil tail surfaces, thus effecting changes in trajectory, thereby guiding the weapon to the target.

The system requires no electrical connection to the unmodified delivery aircraft and is delivered in the same manner as a conventional bomb. There is no requirement for tracking or lock-on before release, which minimises the time required for delivery with resulting reduction in aircraft exposure to hostile ground fire.

The range of Paveway II and III systems currently available is listed below:

(a) Paveway II

GBU-10 – Mk 84 2000 lb bomb; GBU-12 – Mk 82 500 lb bomb; GBU-16 - Mk 83 1000 lb bomb; Mk 13/18 (UK) – Mk 13/18 1000 lb bomb

(b) Paveway III

GBU-24 – Mk 84 2000 lb bomb.

Operational Status

The USAF and USN use the GBU-10E/B (Mk 84), GBU-16B/B (Mk 83) and GBU-12D/B (Mk 82) versions of the Paveway II LGB. These weapons are compatible with the F-4, F-111, F-5, A-6, A-37, A-7, A-4, A-10, F-16, AV-8A (Harrier), B-52, F-14, F-15, F-18, Mirage, Tornado, Buccaneer and Jaguar aircraft.

In addition to US and UK, operators of Paveway II LGBs include Australia, Canada, Greece, Israel, the Netherlands, Saudi Arabia, South Korea, Spain, Taiwan, Thailand, Turkey and 20 other nations.

Specifications

GBU-10E/B

Length: 4.32 m
Body diameter: 457 mm
Tailspan: 1168 mm
Weight: 900 kg
Filling: HE
Lug spacing: 762 mm

GBU-12D/B

Length: 3.33 m
Body diameter: 273 mm
Tailspan: 933 mm
Weight: 225 kg
Filling: HE
Lug spacing: 356 mm

Contractor

Texas Instruments, Dallas (prime contractor).

ism. Saudi officials said the spill is one of the worst in history. Iraq has blamed US bombing, and meanwhile accused US warplanes of causing a second major oil spill off Kuwait's coast.

Other significant developments yesterday included the following:

- Iraq launched more Scud missiles, but to little effect. Israel said one Iraqi missile self-destructed in midair, with debris falling near villages in the occupied West Bank. No one was reported to be injured in that attack. In Saudi Arabia, a Patriot missile was used successfully to destroy an incoming Scud.
- A Marine AV-8 Harrier jet was

tary officials watched on radar screens as Iranian jets flew up to meet an incoming Iraqi flight, but turned back after apparently inspecting it.

Kelly said that 60 of the 80 Iraqi aircraft now in Iran are fighters and bombers while the remaining 20 are transport planes. Military officials have previously said that among the escaping combat planes are F-1 Mirages and MIG-29s, which are widely considered the most advanced in the Iraqi air force.

Kelly asserted that allied jets did not try to intercept and attack any of the Iraqi planes because they were too far away when the Iraqis made

US warships on alert

However, a Pentagon official, noting that more than 20 cargo-transport planes were among those taking refuge in Iran, said it was "conceivable" that the Iraqis brought weapons and maintenance gear with them.

Kelly, asked whether US warships faced a danger if Iraqi planes sweep down from Iran and into the Persian Gulf, said the fleets are on constant alert for an attack from anywhere.

At a briefing in Saudi Arabia, US officials said they were satisfied that the Iraqi flights to Iran would not prove harmful to the allies.

would jeopardize its neutrality if it allowed Iraqi planes to return to the conflict, legal scholars said last night. Detlev F. Vagts of Harvard Law School recalled that Switzerland had maintained its neutrality during World War II by refusing to turn over to the Allies the numerous planes and their pilots that were forced to land there following combat missions.

"The rule is fairly clear that a neutral government must intern aircraft that wanders into its space for the duration of the conflict," Vagts said.

Robert F. Turner of the Univer-

that the country's top pilots may have coordinated a defection.

However, Hunter said the step is more likely part of Saddam Hussein's strategy to extend the war as long as possible and to drag as many members of the US-led coalition into the conflict. In any case, some US analysts doubt Iran would let Iraq use the planes while the war is still going on. A Middle East specialist in the US Senate, noting the enmity that exists between the two countries from their eight-year war, said yesterday, "I just don't believe Iran is going to do something that will

The Saudi government has been forced to shut one of the desalination plants that supply this country with drinking water, but has said that others remain unthreatened by the spill and can produce enough to meet demand. Despite the exprts' arrival, few here hold out much hope that the spill can be cleaned up in the midst of battle.

Michael Kranish, Fred Kaplan and Stephen Kurkjian of the Globe staff contributed to this report from Washington, and correspondent Trevor Rowe contributed from the United Nations.)

1991

Editor's note

Press restrictions imposed by the US-led military command in Saudi Arabia require journalists with US troops to work under military escort and to submit their reports to military censors.

For the record

Editor's note: Garry Trudeau, the creator of Doonesbury, was unable to complete this week's strips on schedule because of illness. His syndicate has supplied the Globe with a substitute set that originally ran in late December 1989.

Correction: Because of a reporting error, the 50-Plus column in yesterday's Business section misstated the monthly income from an "immediate annuity" insurance product. The monthly income should be $343.33 a month, or $4,120 a year.

WEAPONRY

Laser bombs hit targets 60 percent of time, officials say

By Fred Kaplan
GLOBE STAFF

WASHINGTON – About 60 percent of the US laser-guided bombs dropped in Operation Desert Storm have hit their targets, and the other 40 percent have missed sometimes by thousands of feet, according to former and present government officials who are familiar with US intelligence reports.

The scores may help explain why the air campaign against Iraq is proceeding more slowly than many officers had expected, those officials say.

Before the war began, Pentagon officials estimated that it would take about 10 days to complete the air campaign, according to members of Congress who were briefed. By then, they said, the US bombing would have destroyed Iraq's air force, air-defense sites, command-control systems, Scud missile launchers, and its nuclear, chemical and biological-weapons facilities.

However, 12 days into the war, Pentagon spokesmen have reported that while all of these targets have been damaged, none except the nuclear weapons factories have been destroyed.

The Desert Storm results are consistent with the most recent tests of laser-guided bombs, known as the Paveway III program. Of 39 bombs dropped in those tests, 19 – not quite 50 percent – hit their targets, according to a retired Air Force officer familiar with the tests.

The officer, who asked not to be identified, said that the successful bombs landed within 10 feet of their targets, but that the misses landed as far away as five miles.

There are four types of laser-guided bombs in the US arsenal, with payloads ranging from 500 to 2,000 pounds, but they all work on the same principle. A laser beam is aimed at the target and the bomb homes in on the beam, following it all the way to the target, where it explodes on impact. However, several officials say that the beam does not shine through smoke, dust, clouds or rain. Instead, it reflects and refracts these particles, distorting the path of the bomb.

John Lehman, the secretary of the Navy under Reagan, told CNN Saturday that laser-guided bombs "do go ballistic if . . . suddenly a cloud comes between the plane and the target . . . and they'll go wide."

He said in an interview yesterday that as secretary, he had to pay settlement costs "at least once a month" when unarmed laser-guided bombs smashed into resort towns after going "two or three miles off-course" on test ranges in Nevada or California.

Successful bombs landed within 10 feet of their targets.

Lehman, who remains enthusiastic about high-tech weapons, said friends in the Pentagon tell him that about 60 percent of laser-guided bombs have hit their targets in Iraq, which he said is "consistent with the test performances."

An administration official familiar with preliminary assessments of the gulf war confirmed this finding yesterday.

In Vietnam, US planes dropped more than 250 laser-guided bombs and hit fewer than 40 percent of the targets, according to a former Pentagon official who studied the bomb-damage assessments. About half of those targets were road intersections, not the small, hardened targets aimed at in Iraq.

In the 1983 war in Grenada and the 1986 bombing of Libya, the performance of the bombs was even worse, this former official said. The unclassified version of a report by the US General Accounting Office said the laser-guided bombs experienced "significant problems" in those two wars, and that old-fashioned iron bombs – which simply fall out of bomb-bays by the force of gravity – destroyed a higher percentage of targets.

Lehman said that as a result of the misses in Iraq, "there probably have been at least 2,000 or 3,000 civilian casualties." He said: "You do get collateral damage when you bomb. We shouldn't hold illusions about this."

One Pentagon official, who is more critical of high-tech weapons generally, said that while he agreed with Lehman's point, his estimate of casualties is probably too high. "These aren't very powerful bombs at all, compared with what we dropped in World War II or Vietnam," he said.

The Pentagon officially has no estimate of Iraqi civilian casualties.

One senior military official said, "To tell you the truth, we're not really focusing on that question. We have no way of knowing at this point anyway."

The Pentagon officially has no estimate of Iraqi civilian casualties.

Accuracy; also · LAT Sat 20 April reports we never got targets —

Technophoria: Weapons Videos vs. Weapons Policy

By James Fallows and Scott Shuger

IN WARTIME, we're supposed to pull together—but this shouldn't mean that we forget how to think. Yet as soon as the [illegible] against Iraq began, much of Washington's opinion-making class let down its critical faculties in a way it would be ashamed of in [illegible] times.

[illegible]ely three days after the first strike on [illegible], talk-shows and op-ed pages rang [illegible] the first great "lesson" of the gulf war: [illegible] technology" worked for America's mil[illegible]. From that it followed that the Reagan [illegible]istration deserved our thanks for in[illegible] military budgets (although the Carter [illegible]istration could fight for some credit too) [illegible] that the "defense reform" movement, [illegible] criticized the Pentagon's patterns of [illegible] and procurement, had been proved [illegible]tively wrong.

"This is just an unbelievable validation of [illegible] the defense industry has been doing," a [illegible]Webber analyst named Jack Modzele[illegible] was quoted as saying in the Los Angeles [illegible]. George Will looked upon the Patriot [illegible] and concluded that, since it could shoot [illegible] Scuds, it was time to revive SDI. The [illegible] of course, has a single warhead, which [illegible] an absolutely predictable path as it [illegible] Soviet missiles, which SDI is supposed to [illegible]cept, have many nuclear warheads, each [illegible] can be maneuvered as it homes in on [illegible] target—and which, unlike Scuds, must be [illegible]oyed far, far away from the target if lives [illegible] be saved. Distinctions like these would [illegible] automatically to Will or most other people analyzing other subjects. They should be [illegible] about "high tech" and "defense reform" [illegible].

[illegible] Patriots have in fact been effective, [illegible] tells us something about "point defense" [illegible]. But it proves almost nothing about [illegible] Reagan budgets or high-tech weaponry in [illegible]. To turn the logic around, the most [illegible]" and expensive single weapon of the [illegible] years was the B-1 bomber, which has [illegible] sent on a single sortie over Iraq.

[illegible] argument about appropriate weaponry is often presented as a simple high-tech versus low-tech choice, as if it were a matter of preferring swords and muskets to laser-guided bombs and night-vision tanks. We should be interested in any level of technology that works; but we should be empiricists, wanting to be convinced case by case, via thorough testing and performance. The defense reform analysis was never about technology per se. It was, above all else, about military *effectiveness*, which led to a subsidiary bias against needless complexity in weapons design.

Complexity is not the same thing as high technology: a semiconductor chip is much more technologically advanced than a vacuum tube, yet it is much simpler, more robust and more effective in military or civilian use. By analogy, certain weapons use advanced technology to become more reliable: One example is the A-10 attack plane, which carried out very dangerous low-level missions in the first two weeks of combat without suffering any losses. Jamming devices and anti-radiation missiles, which home in on the enemy's radar, are technologically advanced and yet effective. (That these comparatively low-cost technical edges have not been the main object of the pundits' attention is a tell-tale indication of the true nature of their ardor.)

The problem with complexity is that it introduces more possibilities for failure—within the machine itself, between man and machine and between the machine and the environment in which it's used. Highly complex weapons cost more to build and are harder to maintain, so for the same amount of money there are fewer of them in action. The appropriate level of complexity, then, depends on how effective they are—in realistic tests and in combat.

What the empirical evidence from Persian Gulf combat tells us is . . . almost nothing so far. No one yet knows the most crucial fact about this war: how it will turn out. It seems certain that the U.S. side will prevail, since its material advantages are so overwhelming. (Defense Secretary Richard B. Cheney has emphasized that Iraq spent $50 billion over the past decade to build its vast arsenal. The U.S. military has spent $50 billion since Thanksgiving and over the last decade outspent Iraq about 50 to 1.)

But, despite the spectacular videotapes, we do not yet know how effective our weapons have been in the unpredictable circumstances of real war. Two days into the fighting, U.S. military briefers said they believed that all the fixed-site Scud launchers had been destroyed. The Scuds kept coming and, according to sources in the Pentagon, it now appears that most of the "fixed-site launchers" initially hit were in fact decoys. A Soviet expert told the BBC last week he had advised the Iraqis on techniques of deception such as hiding airplanes in apartment buildings and painting "craters" on runways to deter further bombing runs to keep the U.S. technical advantage from being put to full use. With similar tricks the Iraqi command-and-control system remained at least partly operational under intense attack.

Nor do we know how many of our weapons have slithered through windows and down chimneys, compared to how many have landed in empty fields or on civilian targets. The mistakes too are recorded on tape that is for now, and perhaps forever, unseen. After the bombing raid of Libya in 1986, the Pentagon released a video of a direct hit. That turned out to have been one of the few accurate bombing runs. A GAO analysis of the mission concluded that laser-guided bombs were actually less accurate than old-fashioned unguided bombs.

In the 1989 raid on Panama, a bomb from an F-117 Stealth fighter missed its target by over 300 yards, despite the Pentagon's initial claims of "pinpoint accuracy." In an astonishing interview last week on CNN, John Lehman said off-handedly that when he was secretary of the Navy he used to pay settlements "at least once a month" for damage done when laser-guided bombs hit resort towns in California and Nevada, two or three miles from the target area. Lehman later told Fred Kaplan, of the Boston Globe, that laser-guided weapons were hitting targets in Iraq about 60 percent of the time. This, Lehman said, was "consistent with the test performances"—but quite inconsistent with the ratio suggested by the very few videos the Pentagon has shown.

Similarly, we have been told in briefings that Tomahawk cruise missiles, [redacted] 90 percent of their targets. Yet just two days ago CNN ran footage of Tomahawks flying into Baghdad and destroying residential buildings. Cruise missiles may be promising, but we should see more evidence of their performance, especially about their vulnerability even to unguided fire from the ground.

Cost has been the great unmentionable in the "everything works" reaction. Against any enemy except one we outspend 50 to 1, our resources are limited. Choosing to build one weapon means choosing not to build or properly maintain another—in the case of complex weapons, choosing to build one F-117 or B-2 means choosing not to build scores of A-10s or F-16s. During the Vietnam War, about two-thirds of all sorties flown were to drop ordnance. In the gulf, only about half are—the rest are for the increased support these airplanes require. Expensive, delicate weapons have to be not just good, but far better than good, because of the options they foreclose.

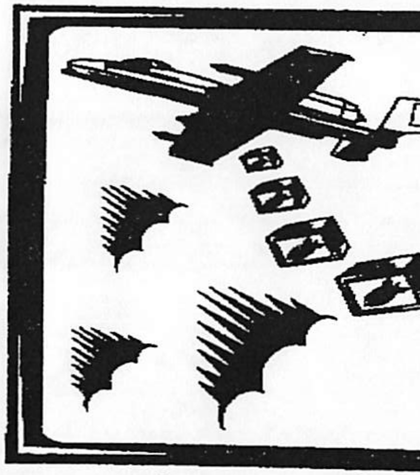
Indeed, the wave of excitement about the weapons is itself a sign of trouble. If there were more realistic testing within the Pentagon, there would be less doubt about how the weapons would actually perform. But the system that develops the weapons has a bias against realistic testing; it is not by accident that overpriced fiascos like the B-2 bomber have rarely been tested at all, and then usually fraudulently—[redacted] and the Stealth fighter [redacted] they would fail.

The Pentagon procurement system—with its bias against realistic testing and cost-cutting, with its potential to convert the officer corps into budget-boosters rather than military leaders—is at the heart of the "reform" debate. Almost every outside analysis of the system's incentives and performance concludes that things are severely amiss. Paine Webber's Modzelewski gave the game away with his reaction to the first news from the war: "The real beneficiaries are going to be the big companies like General Dynamics, McDonnell Douglas and Lockheed." The weapons that work often emerge in spite of this system, rather than because of it—for instance, the Air Force tried to wriggle out of the A-10.

Although it's now a cliché to remark that there is still a long way to go in this war, and that major ground action is increasingly likely, many in Washington (in and out of uniform, with and without TV shows) don't seem to have realized that this prospect alone should dampen their technophoria. The consequences of technical failure look much different when we move from the Tomahawk to the Abrams tank or the TOW anti-tank missile. And as defense consultant Pierre Sprey observes, "When an air-to-ground missile fails, the pilot still comes home. When an infantryman's TOW fails, he does not come home."

The point of these cautions is not to say "nothing works" or to quibble about imperfections. The question we should consider, once we know enough about the gulf war to draw sensible conclusions, is whether our weapons proved effective *enough*—enough to forestall grisly land warfare, enough to justify their great cost. We won't always enjoy such a one-sided advantage in spending and tactical realities. We must still think, rather than just enthuse, about the way to build our forces.

[illegible], author of "National Defense," is [illegible] editor of the Atlantic Monthly. [illegible], a former naval intelligence [illegible] is an editor of the Washington Monthly.



PETER HOEY—THE WASHINGTON POST

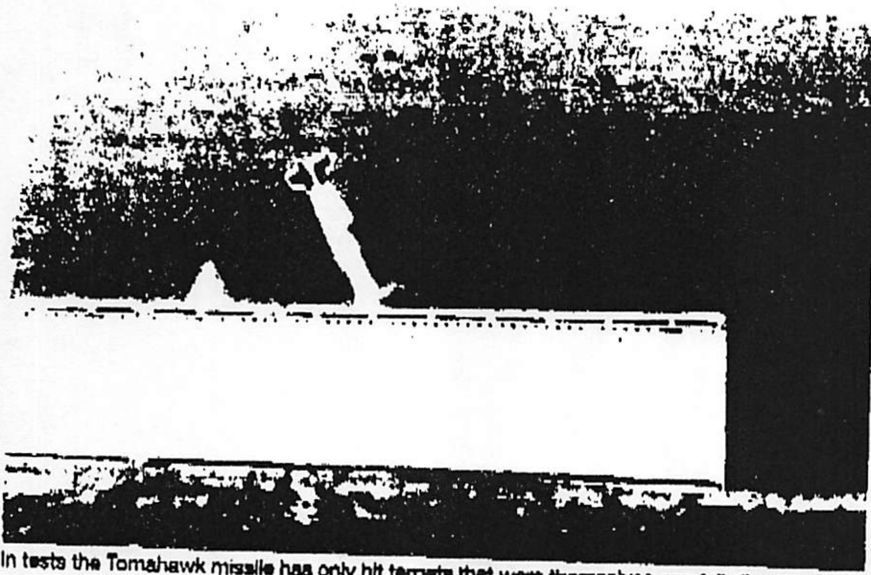
Accuracy – Cruise missiles hitting residential areas of Baghdad

Even modern high-tech weapons can't make "surgical" strikes; GE boycotters block sales of $500,000 machines

IRAQ

Surgery with a Tomahawk

By ERIC H. ARNETT



In tests the Tomahawk missile has only hit targets that were themselves carefully "pretested."

In an attempt to maintain domestic support for military action against Iraq, some U.S. leaders have revived the notion that "surgical strikes" would minimize civilian casualties. And one of the most talked-about weapons for such precision attacks is the conventionally armed variant of the navy's Tomahawk sea-launched cruise missile (SLCM).

During a September 9 congressional hearing, North Carolina Republican Sen. Jesse Helms said that a number of Iraqi targets should be allocated to the SLCM so that the missile, whose nuclear version has been the subject of controversy at the U.S.-Soviet strategic arms talks, could prove its mettle. Other unnamed congressional backers of the Tomahawk were cited in the September 10 *Washington Times* as coming up with 19 SLCM "strategic targets" in Iraq.

This rhetoric misses three important points:

- modern mechanized warfare obviates the claim of "surgical strikes";
- even if such strikes were feasible, the Tomahawk is technically incapable of the required accuracy;
- the navy and air force prefer to use manned bombers.

Gen. Michael Dugan was fired as air force chief of staff on September 17 after he described potential Iraqi targets to reporters. He said that the military's core list includes air defense sites, missile bases, and civilian and military airports, but added that the military services concurred that several other targets, especially "downtown Baghdad," would probably also be attacked.

Even if the United States targeted Iraq's military installations alone, the strikes could only be considered surgical in the sense that "using an electric chainsaw" for amputation is surgery, according to Anthony Cordesman, a defense analyst working for Sen. John McCain, Republican of Arizona. Speaking at a September 12 Brookings Institution seminar, Cordesman said that the war would not be fought "with high-tech toys. There will be thousands of casualties."

The Tomahawk SLCM, which is deployed on U.S. battleships, cruisers, destroyers, and attack submarines, is one "high-tech toy" present in the Persian Gulf. Greenpeace USA estimates that more than 100 conventionally armed SLCMs are on surface ships in the area along with about 50 nuclear SLCMs, not counting those on submarines.

Yet, the Tomahawks are unlikely to see action in Iraq should the shooting start. Although officially in the category of long-range "precision-guided weapons" favored by designers, ample evidence is available to show that this missile won't work as advertised.

Accuracy is a major problem. The Tomahawks use a system for terminal guidance called DSMAC (digital scene-matching and area correlation) which contains many faults. DSMAC compares scenes passing under the missile with a digital representation of the same scene in a database previously stored in the missile. But, according to a 1989 report by Kim T. Constantikes, a Johns Hopkins engineer involved in designing the system, DSMAC's computer is limited: it converts the scenes picked up by the missile's camera to crude, black-and-white images, without grays, and cannot rotate or enlarge images. Nor can DSMAC operate while the missile is banking.

More important, DSMAC has never been submitted to rigorous tests. "The navy has no way of knowing whether DSMAC would work or not," says an analyst for the U.S. General Accounting Office who is familiar with the DSMAC test program. A frustrated engineer involved in developing the latest version of DSMAC agrees: "We are not permitted to perform any tests in which DSMAC might fail." Instead, DSMAC has been flown over a small number of carefully surveyed and

(continued on page 47)

Cruise Accuracy - Nothing

the approval of most of its elected officials, has given Israel billions of dollars of aid and other favors costing American taxpayers additional millions.

During the Cold War this expenditure was defended by the professed need to promote national security, presumably against the Soviet threat. Israel was described as a valuable ally in the defense of the Middle East. At the same time many proponents of aid to Israel fought tooth and nail to oppose arms aid to other countries in the Middle East, particularly to Saudi Arabia, on the grounds that it would threaten Israel.

Now the Cold War has ended. Thousands of American servicemen are stationed in Saudi Arabia and in surrounding areas. U.S. support of and identification with Israel is a major embarrassment to the United States in its relations with Arab countries whose help is needed to defend against a new aggressor. Israel is virtually worthless as a military defender of U.S. interests in the region. Indeed, its participation in that defense would immediately and gravely undermine it.

The U.S. budget and economy are in serious jeopardy. The costs of Desert Shield will be monumental. We simply can no longer afford to carry detrimental fiscal burdens like Israel.

Charles R. Gellner
Silver Spring, Maryland

TOMAHAWKS *(cont. from p. 7)*

extensively "pretested" scenes.

Weather, blowing sand or smoke, seasonal changes, construction projects, and even daily lighting variations could lead DSMAC to miss its target. The ideal Tomahawk strike, then, would use images collected 24 hours before the missile was to fly over a given course, in similar weather. That is not yet possible, despite improvements in satellite intelligence sharing.

But steps apparently have been taken to make images compatible with DSMAC available to navy mission planners in the Gulf. In early August, Jerry Blesch, captain of the battleship *Wisconsin*, told Cable News Network that he did not have mission plans to send the 32 Tomahawks on his ship against Iraq. But on September 12 he told the *Washington Post* that he does now.

The Tomahawk's small warhead would do little damage to most military targets even if it managed to find them. Specially protected targets such as underground nuclear, biological, and chemical research and production facilities would emerge from Tomahawk attacks unscathed. Some Tomahawks dispense submunitions—large numbers of smaller explosives distributed over a wider area—to compensate for the missile's limited payload. These could damage fixed air defense installations or civilian and military airports but could not be used against tanks or other moving targets. Since runways are relatively easy to repair, airports would have to be attacked more than once a day. At that rate, the navy's supply of Tomahawks would be exhausted quickly.

Given these limitations, the navy and air force prefer to use bombers. Extensive precautions have been taken to protect pilots, and except for the B-1B, every U.S. bomber type has been tested in combat. The Tomahawk has not.

Last year, while he was still chief of naval operations, Adm. Carlisle Trost reiterated his skepticism about SLCMs in an address at the Naval War College: "In our inventory today we have cruise missiles and other so-called 'smart' weapons. . . . In the future we will rely on such systems to an increasing extent. But nothing in our inventory today, and nothing I understand is on the drawing board, is capable of substituting for warriors. . . . 'Fire and forget' is simply wishful thinking." ■

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In most cases, articles should be no longer than 3,000 words. Footnotes should be kept to a minimum in both length and number, but they should contain all essential information: author, title, name of publication (if a periodical), location and name of publisher (if a book), date of publication, and page references. All acronyms should be defined, and all personal first names should be spelled out. Illustrative material may be included, but the *Bulletin* reserves the right to use additional or alternative illustration. All materials submitted should be accompanied by brief biographical data, including the author's current position, institutional affiliation, the names of recently published books or monographs, and address and telephone number. Articles should have titles, but authors' titles usually are rewritten to meet journalistic or space requirements. The *Bulletin* follows the *Chicago Manual of Style*.

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The editors select book reviewers and books to be reviewed. Unsolicited reviews generally are not accepted.

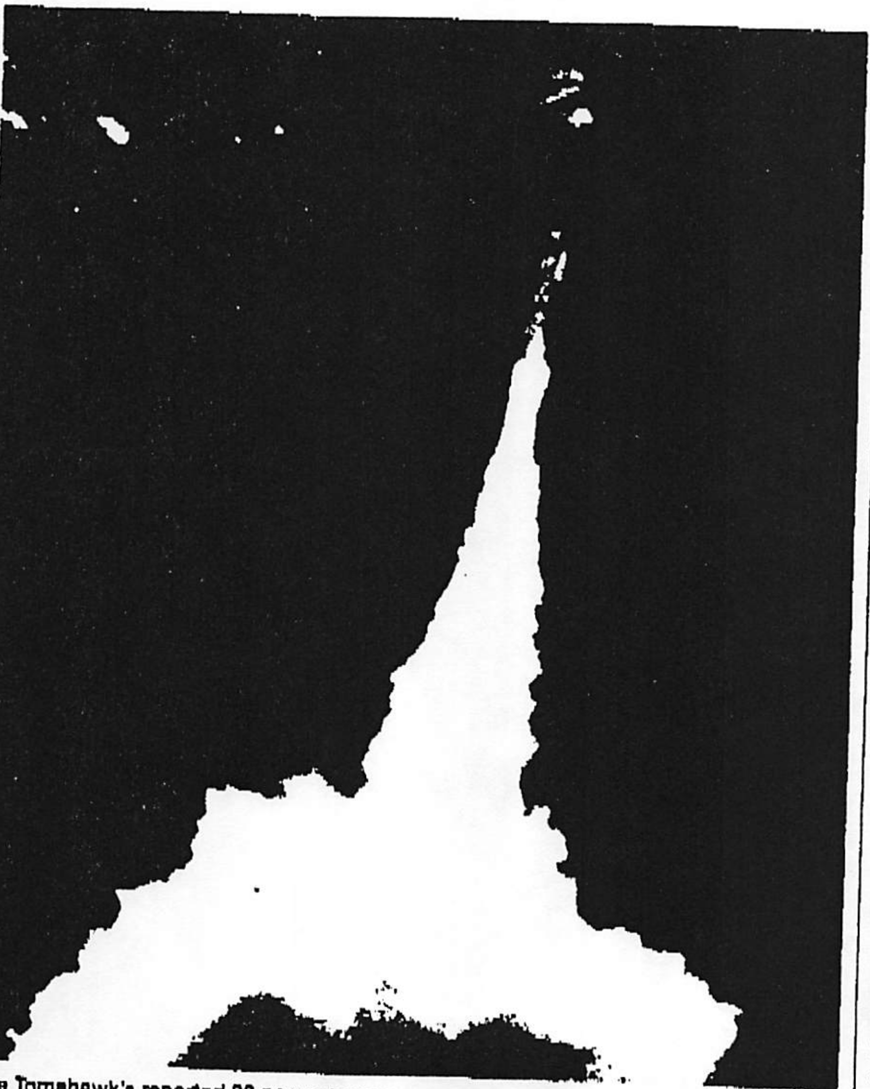
There is much less to the Tomahawk missile than met reporters' eyes; Test ban amendment process, buried under war news, remains alive

* See also for politics of weapons used!

GULF WAR

Awestruck press does Tomahawk PR

By ERIC H. ARNETT



The Tomahawk's reported 90 percent success rate referred to the number that did not stick in their launchers.

In the first days of the Kuwait war, the Washington community was bedazzled by the apparent successes of the expensive high-tech weapons built during the Carter-Reagan defense buildup. One of the systems that got the best press was the Tomahawk, a sea-launched cruise missile (SLCM) whose nuclear-armed version has been the cause of contention in arms reduction talks. The navy launched 216 conventionally armed Tomahawks in the first two nights of the war, and claimed that more than 90 percent hit their targets, including 51 of 52 in the first wave. At his first wartime press conference, Joint Chiefs of Staff Chairman Colin Powell said he was "extremely pleased" with the Tomahawks' performance.

Forgetting how the Pentagon misrepresented the F-117 "stealth" fighter's poor performance during the Panama invasion, reporters swallowed claims about the Tomahawk almost without question. With typical media excitement, *Fortune*, in a February 23 article on the war's windfall for the weapons industry, said the Tomahawk could hit "a target the size of a mailbox with almost as much accuracy as the postal service." Others claimed that the Tomahawk could be guided to a specific doorway or window. Even Greenpeace's February 6 *Situation Report* on the Tomahawk remarked that "concerns . . . that the conventional missile's guidance system might not work . . . seem unfounded." But there is ample reason to remain skeptical.

There is little firm evidence that the Tomahawks' performance was even adequate. The navy's initial claims were made before bomb damage assessment was possible, and first reports on SLCM attacks are less reliable than those about attacks launched by piloted aircraft—SLCMs do not have pilots or gun cameras to provide even a rough estimate of a sortie's effect. Early reports that bomber sorties were 80 percent successful were later revised; only 60 percent of the most accurate laser-guided bombs hit their targets. The 80 percent figure instead reflected the number of pilots who saw their targets and dropped their bombs.

In a January 21 report, missed by the major media, *Navy News and Undersea Technology* revealed that the Tomahawk's initial success rate was based on the number of missiles that had not

Excellent

Accuracy - Cruise Missiles

stuck in their launchers. Official sources still refer to those missiles as "successfully performing their missions," but one naval official involved with the strikes says privately, "We don't know how many have actually hit their targets."

Although Western journalists' reports from Baghdad seemed at first glance to confirm the navy's claims about the Tomahawk, they have proven unreliable. Swept away by the drama of "smart weapons," reporters saw Tomahawks everywhere. But few of these correspondents have military experience, nor can they clearly distinguish a Tomahawk flying at night, just above the treetops, at 550 miles an hour, from other types of missiles and glidebombs that may have been launched from aircraft as far as 30 miles away. These same reporters often misidentify slower-flying, piloted aircraft in broad daylight. For the same reason, accounts that at least two Tomahawks flew into residential neighborhoods and that an unspecified number were shot down by ground fire should be treated with equal skepticism.

One reporter said he saw a cruise missile neatly slice in half a transmitting tower, a target the navy would not have allocated to the Tomahawk. As a rule of thumb, the navy expects fewer than half of the Tomahawks launched to pass within 10 meters of their "aimpoints." In fact, the overall Desert Storm military plan did not reflect much confidence that the Tomahawk would work even in its primary role of "defense suppression."

CEP?

Navy doctrine envisions using the Tomahawk for "precursor strikes" on air-defense radars, missiles, and command centers, to decrease risks to bomber pilots, and it appears the missile was used in that role. But Iraq's best air-defense weapons, the French "Roland" surface-to-air missiles, are mobile and therefore immune to Tomahawk strikes. Five British Tornado bombers were lost in dangerous, low-altitude bombing raids against airbases during the first week, another indication that planners were not convinced that the Tomahawks' defense-suppression strikes had made higher flying safe. And the Tomahawk D, designed to attack airbases, was not launched at all during the first two weeks of war. Fearing that SLCMs would miss another pair of key air-defense targets, the army dispatched bands of helicopter-borne commandos to destroy Iraq's two primary air-defense headquarters near Basra on the first night of the war. Evaluating the Tomahawk's performance is also complicated by the fact that, as a precaution, its targets were probably also bombed by piloted aircraft in follow-up attacks.

The Desert Storm planners' caution reflects prewar doubts. In December, General Powell told the Senate Armed Services Committee that smart weapons were "may-work options" that he would not count on if lives were at stake. Rich Wagner and Ted Gold, who both held high positions in the defense secretary's office during the Reagan administration, noted in a recent paper that "Western prowess in smart weapons and associated surveillance systems [is] a capability . . . more potential than real." In its 1988 report, *Discriminate Deterrence*, President Reagan's Commission on Integrated Long-Term Strategy called for vigorous efforts to develop workable guidance packages for long-range smart weapons: "Technology has not yet accomplished this. . . . Weapons with this capability will probably not be available in quantity for 15 to 20 years." Even Richard Garwin, the innovative physicist who, along with Elmo Zumwalt, then chief of naval operations, shepherded the land-attack SLCM into an unwilling navy, conceded recently that "at least two more generations of development and test" will be needed to overcome Tomahawk's limitations.

In a recent interview, one of the system's senior engineers termed the missile's guidance program, the "digital scene-matching area correlator" (DSMAC), "fickle," and another engineer said that the program's problems are "not solvable." As the Tomahawk flies toward its target, DSMAC's optical sensor sends a view of the landscape below to its guidance computer, which compares the view with a digital description in its memory. Despite media reports to the contrary, most recently in *Newsweek* (February 18, 1991), DSMAC does not "look forward" and never "sees" its target—its warhead detonates at a preset time after it sights its last "waypoint." A 1989 report from the Johns Hopkins Advanced Physics Laboratory (APL), which designed DSMAC, says that the current version of DSMAC requires more contrast than most scenes provide, a problem that is aggravated at night. After dark, the DSMAC relies on a strobe light, but when the Tomahawk is cruising at an altitude at or above 30 meters, the strobe light probably cannot replicate the naturally lit scene stored in its memory. DSMAC's sensor is only sensitive to visual and near infrared light and it lacks night vision equipment. The system had only three night-time tests, all on "pretested" routes, part of a series of tests that were widely criticized—publicly by the General Accounting Office and privately by APL engineers. *Discriminate Deterrence* described the Tomahawk testing program as so poor that it gave "the discussion of smart weapons an unnecessarily theoretical cast."

The first phase of the bombing campaign ended after two nights. Since then, Tomahawks have been launched at an average rate of no more than four a day. By February 23, a total of 284 had been launched from battleships, cruisers, destroyers, and submarines, but none had been launched after February 2. Although most Tomahawks are carried on destroyers and cruisers, those launched from the submarine USS *Louisville* and the battleships USS *Wisconsin* and USS *Missouri* were played up by the navy. Because both battleships are due to be decommissioned this year, and because the navy recently cut its projected fleet of new, $2.3 billion Seawolf-class submarines from 30 to five, some observers saw the inclusion of submarines and battleships in the air campaign as cynical grandstanding for a congressional audience.

Before the war, Capitol Hill's Tomahawk boosters urged the navy to use it to destroy "strategic targets," including factories producing chemical weapons and ballistic missiles. After two weeks, [illegible] air sorties, and an unknown number of Tomahawks launched against [illegible] of these targets, Pentagon briefers reported that only 17 were destroyed or damaged. ■

Eric H. Arnett, a program associate of the Program on Science and International Security at the American Association for the Advancement of Science in Washington, D.C., is the author of Sea-Launched Cruise Missiles and U.S. Security *(forthcoming). The views expressed are his own.*

SHOWDOWN IN THE GULF

Bombs, Pound for Pound

The United States and its allies at war against Iraq have conducted thousands of bombing sorties in an attempt to destroy Saddam Hussein's air defense capability, his Air Force, Army, and command and control networks. It is a job that has required a variety of specialized bombs and air-to-surface missiles.

Paveway Laser-Guided bombs: The United States keeps a family of laser-guided bombs in its arsenal. The latest version, Paveway III, is designed to be delivered from low altitudes and standoff ranges. Paveway was fired from fighters such as the F-15E, F-111 and F-16 against defended targets in Iraq. First fielded in the 1960s, Paveway is guided to its target by the onboard Pavetack laser guidance system. Manufacturer: Texas Instruments.

Cluster bombs: These bombs deliver bomblets or electronically timed mines that can detonate periodically. Timed detonations can keep enemy forces at bay. Cluster bombs, such as the Combined Effects Munition, can be delivered by all types of aircraft. They are intended to kill exposed soldiers, trucks and lightly armored vehicles. Manufacturers: several, including ISC Technologies Inc., Alliant Techsystems Inc., and Aerojet Ordnance Division.

HARM: The High Speed Antiradar Missile (HARM) is fired from F-4G Wild Weasel and EA-6B Prowler jammer aircraft as well as fighters seeking enemy radar in the initial days of the air campaign. The HARM, with a 45-mile range, uses an antiradar homing seeker that detects radar emissions. Manufacturer: Texas Instruments.

SLAM: The Stand-Off Land Attack Missile (SLAM) can be fired from either A-6 or F/A-18 Naval aircraft. Using a television homing system, SLAM is a derivative of the Harpoon missile and uses a 500-pound warhead. It is designed for ships and a variety of land-based targets. Manufacturer: McDonnell Douglas.

ALARM: The British ALARM antiradar missile was used by Tornado pilots to attack defended radar targets inside Iraq. ALARM uses computer-controlled radar-homing sensors. The British also used JP233 airfield bombs that drop runway-busting rockets and antipersonnel mines to wreck enemy airfields. Manufacturers: British Aerospace and Marconi Defense Systems Ltd.

Maverick: The Maverick is a precision-guided tactical missile fired from a range of aircraft that include the A-10, F-4, and F-16. Guided by an infrared or television homing system, the Maverick has a range of about 15 miles and is intended for close air support missions and soft targets. Manufacturers: Hughes Aircraft Co. and Raytheon Co.

GBU-15: Part of the GBU series of glide bombs, this 2,000-pound smart bomb can be fired from F-111, F-15 and B-52 aircraft. Designed with wings, it has a range of up to 45 miles and was used by allied forces to strike heavily defended fixed targets such as Scud missile sites and airfields. The GBU can use a television homing system. Manufacturer: Rockwell International.

Gravity bombs: Primarily weapons of the B-52 strategic bombers, gravity bombs are used to attack dispersed and camouflaged forces. Their weights range from 500 pounds to 2,000 pounds. The B-52G can carry more than 35,000 pounds of such ordnance.

Sources: Department of Defense, Center for Defense Information.

U.K. Examines New Tactics For Low-Flying GR1 Fighters

By CHARLES MILLER
Defense News Correspondent

LONDON — High attrition rates are forcing the Royal Air

Some of the Tornados are bombing airfields from medium-level heights using 1,000-pound bombs while under the protec-

SLAM Missile Bolsters Navy

By ROBERT HOLZER
Defense News Staff Writer

WASHINGTON — The Navy last week added a new guided missile to its inventory of high-technology weaponry pounding Iraqi military targets as part of Operation Desert Storm.

Called the Standoff Land Attack Missile (SLAM), it is fired from Navy attack aircraft such as the A-6 Intruder or the F/A-18 Hornet and designed to hit hardened targets such as communications bunkers or ammunition storage facilities with pinpoint accuracy, Navy and defense industry officials say.

"It helps the pilot to retain the edge over the defensive forces by allowing him to fire at a standoff distance from a target, and it is particularly useful and effective . . . ," Rear Adm. Conrad Lautenbacher, commander of Cruiser/Destroyer Group Five, said last Monday at a briefing to reporters in the Saudi Arabian capital of Riyadh. The missile scored two direct hits on an unidentified strategic target in Iraq, the admiral said.

However, the Navy's inventory of the sophisticated missile remains limited. Officials with McDonnell Douglas Missile Systems Co., the St. Louis-based builder of the SLAM, say they have delivered 42 missiles to date, and are building 72 additional missiles as part of the Navy's 1989 weapon purchase. Later this year, they expect to begin work on another 125 missiles.

"There is a very small number in the fleet. The inventory is just starting to grow," a McDonnell Douglas official said.

Navy spokesman Lt. Dave Wray said last Thursday that SLAM is the only standoff weapon in the Navy's inventory that is capable of hitting targets ashore. He added that each missile costs about $800,000.

The SLAM has a range in excess of 50 miles and packs a 500-pound high-explosive warhead. The program developed as part of an urgent Navy requirement for a long-range standoff weapon system that emerged from assessments of the attack on Libya in 1986, company officials say.

SLAM is derived from the Har-

The SLAM is unique in that it can be fired from one aircraft and guided to its intended target by another aircraft flying nearby. For example, in the attack last week the missile was fired from an A-6E, but guided to its target by an A-7 Corsair II light attack aircraft.

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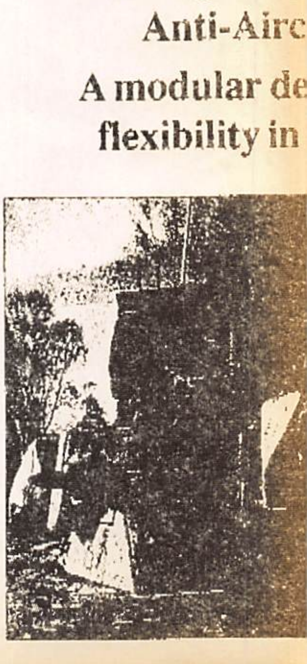

From: U.S. NEWS & WORLD REPORT [APRIL 1, 1991 - p. 16]:

"Although top U.S. commanders last week estimated that Iraq suffered at least 100,000 military deaths during the war, other sources in the Gulf say that the final total — including civilian fatalities — will be at least twice that. These sources say that the Allied aerial attacks inflicted far more casualties than previously thought."

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returning from a mission over Iraq experienced engine failure during mid-air refueling; the pilot ejected and was rescued. Also, a Marine Chinook helicopter made a crash landing and was declared "not repairable," Neal added.

Sporadic border skirmishes con-

In other combat action, British bombers again attacked airfields and Iraqi artillery positions. Sixty percent of Iraq's hardened aircraft shelters have been destroyed now, according to Group Capt. Niall Irving of the Royal Air Force. Noting the successful destruction of an

the military in favor of Soviet diplomatic support for Saddam's regime was reflected in a first-person account in the conservative daily, Sovietskaya Rossiya, by a Soviet general who accompanied Aziz on his last trip from Moscow to Baghdad. Maj. Gen. Viktor Filatov compared the allied bombardment of

earth," Saddam said.

Dobbs reported from Moscow, Atkinson from Washington. Staff writers Dan Balz, Helen Dewar, David Hoffman, Barton Gellman, Al Kamen and staff researcher Lucy Shackelford contributed to this *report.*

ed Bombs Are Likely to Have Missed Iraqi Targets

veen the promise and perform-
d munitions in warfare was de-
ring the 1986 U.S. raid on Lib-
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ssional performance . . . . We
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was illustrated at the time by
smart bombs striking Libyan
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said that the GBU-10 laser-
dropped by eight F-111 air-
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of the GBU-10s accidentally
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rgeted radars in Libya. The
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to avoid destruction. But the missiles then followed an unguided trajectory and hit unintended sites; at least one may have been recovered from the desert by the Libyans and turned over to the Soviet Union.

"If your car started as often as these munitions worked, you would not think you had a reliable car," said a source who has read the reports and disputes the Navy's assertion of success. Both anti-radiation missiles have been extensively used in Iraq and Kuwait.

The GBU-27, a 2,000 pound laser-guided bomb dropped solely from the Air Force's F-117 "stealth" aircraft, has, in contrast, been one of the success stories of the past four weeks, according to Lt. Gen. Charles Horner, commander of allied air forces in the gulf war.

Two such bombs were used in a pinpoint strike on the Baghdad building targeted last week as an Iraqi military communications center, which later appeared to have been sheltering hundreds of civilians killed in the attack. The GBU-27 also was used effectively in nighttime raids on scores of Iraqi aircraft shelters, which Western officials believe caused the Iraqis to transfer more than 120 combat planes to Iran.

A senior official familiar with the raids said their high success rate was due to a special guidance mechanism in each GBU-27 that contributes also to the bomb's high cost—roughly $100,000, compared to an average of $50,000 for a less sophisticated precision-guided munition. Moreover, each "stealth" fighter carries top-of-the-line night-vision equipment and an unusually stable laser designator, capable of remaining fixed on a target even during extreme aircraft maneuvers.

Officials say a cheaper 2,000-pound laser-guided bomb, the GBU-24, has been dropped by at least four different types of U.S. aircraft on Iraqi targets despite earning low marks for accuracy during its development in the early 1980's. The GBU-24 was designed for release at low altitudes. But according to two former defense officials familiar with the bomb's history, its poor accuracy rate and mushrooming cost were the chief reasons that production of the weapon was canceled by the Air Force in 1985 after only 5,000 to 6,000 of a projected 70,000 bombs were made.

In a 1985 presentation to the Defense Science Board, Pentagon officials reported that a low-level laser-guided bomb had achieved 20 target hits out of 39 aircraft drops in realistic operational tests, the final step before beginning full-scale production. The infrared-guided GBU-15, a 2,000-pound munition, had achieved five hits out of 10 drops, and the infrared Maverick anti-tank missile was said to have achieved eight hits out of 12 launches, the officials reported. Both the Maverick and GBU-15 are being used in Iraq.

Former Navy Secretary John Lehman said that laser-guided bombs historically have come within 10 feet of their intended target about 60 percent of the time, although a senior defense official said he believes this estimate understates their actual record during the gulf war. "Operational testing can include mistakes due to poor training or weapons bugs that get fixed later," the official said.

Lehman and other officials said precision-guided munitions typically fail when they lose "sight" of laser light aimed by pilots and reflected back from the target, due to extreme aircraft manuevers, clouds, smoke or dust from nearby explosions. Lasers also simply can be aimed at the wrong target, as they were in Libya and in the incident involving the mistaken bombing in downtown Baghdad; either pilot error or enemy deception can cause such a mistake.

"Then you have the possibility of collateral damage," Lehman said. "I'm sure some few of these Iraqi claims of collateral damage are true."

Navy officials have said that according to preliminary estimates, 85 to 90 percent of the 290 Tomahawk cruise missiles accurately struck the targets they were aimed at. According to this formula, at least 29 of the $1 million weapons struck unplanned sites.

When asked recently about collateral damage from U.S. bombs, White House spokesman Marlin Fitzwater said "the state of our technology has led people to believe sometimes that we have abilities to detect things or to avoid targets, or whatever, that we don't always have. . . . On the other hand, my study of recent histories would indicate that the purpose and goal of limiting civilian casualties is one that . . . we're just, generally speaking, better able to do now than we've ever been in the past."

Staff researcher Lucy Shackleford contributed to thisreport.

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Inside the Pentagon's

Inside the Navy

an exclusive weekly report on Navy programs, procurement and policymaking

Vol. 4 No. 12 - March 25, 1991

Weapons Accuracy

As major debate takes shape

POST-DESERT STORM ESTIMATES REVISES TOMAHAWK EFFECTIVENESS DOWNWARD

More deliberate Navy assessments of the effectiveness of the Tomahawk cruise missile in Operation Desert Storm have begun to show that the mission effectiveness of the highly-touted weapons system is roughly 15 percent lower than first reported. Much of the data is still being collected and examined, as Navy and DOD sources have stressed, "so it's still to early to tell" with any certainty just how well the cruise missile performed, a Navy source said. At this point, officials are "struggling to come up with the numbers" most of which are "highly classified."

Nonetheless, estimates of 90-plus percent effectiveness, as initially reported in the wake of

continued on page 5

SURFACE WARFARE CHIEF'S LAB CLOSURE CONCERNS STIFLED BY NAVY ACQUISITION CZAR

Assistant Chief of Naval Operations for surface warfare VADM. Robert Kihune abruptly withdrew a 2-page memorandum voicing deep personal concern about the potential closure or realignment of the Naval Coastal Systems Center (NCSC) Panama City, FLA due to pressure placed on him from the Navy's top acquisition chief Gerald Cann, according to Service sources. The closing of NCSC may place the surface warfare Navy in jeopardy on key r&d capabilities such as mine countermeasures and torpedo defense, according to sources, who say Cann has reportedly received a lot of criticism from Navy and laboratory officials in pushing through his own version of the Navy laboratory consolidation plan.

In the March 4 letter, obtained by *Inside the Navy's* sister publication *Inside Defense Electronics*,

continued on page 10

CONFEREES MOVE TO KEEP KENNEDY SLEP; MAJOR VICTORY FOR PHILA. NAVAL YARD

At presstime Friday Senate/House conferees had reportedly decided to reinstate the Service Life Extension Program (SLEP) for the USS Kennedy, in essence rejecting Senate efforts to support the Pentagon plan to downgrade this SLEP to a complex overhaul (COH). The move, which is also crucial to the fate of the Philadelphia Naval Shipyard, maintains yet another carrier in a year when the total carrier force structure will be fundamentally debated because of Pentagon plans to reduce the eventual size of the carrier force to 12.

The move is also significant because of a brewing battle between the Pentagon and Congress over Pentagon efforts to sidestep congressional direction contained in report language. Dropping the Kennedy SLEP is yet another attempt by the Pentagon to back out of specific agreements in the FY-91 defense

continued on page 9

ELECTRIC BOAT VP SAYS BUILDING DIESEL SUBS A VIABLE ALTERNATIVE TO MORE SSN-21s

James Turner, the executive vice president of General Dynamic's Electric Boat shipyard, quietly hinted last week that the Navy could at least partially avert the impending collapse of its nuclear submarine industrial base by building conventionally powered submarines. Turner's statement came during testimony last week before the Senate Appropriations defense subcommittee during which Turner, Edward Campbell, president of Newport News and Navy Secretary Lawrence Garrett argued for increasing the build of the SSN-21 up from the current rate of one boat per year.

While U.S. shipbuilders are privately insistent the Navy end its longstanding taboo against allowing shipbuilders to build diesel-electric submarines for the international market, all are extremely reticent

Inside

Navy R&D Lab Consolidation — page 10

VADM Brooks on Soviet, Third World Threat Part II — page 7

system programs," according to the report.

The IG audit identified several weaknesses in DOD directives requiring baselining, in particular a lax reporting requirement for program managers when there is a significant change in baseline estimates. Where the Services did a good job in providing baselining data, this data provided the DAE with an effective mechanism for performing his acquisition oversight responsibilities, according to the IG. Further, the DAE was able to use the baseline concept to manage major weapon system programs and to stabilize programs when problems were identified.

The IG report asserted that baseline agreements represent a contract between the military department program managers for major system programs and the acquisition executives to execute the programs within certain key parameters. Baseline descriptions include the following key parameters: performance, cost, schedule, and other factors critical to a program's success.

The program manager for the BSY-2 Submarine Combat System did not alert the DAE when major test completion dates slipped by more than 180 days and development costs increased by more than 15 percent. As a result, the DAE was not promptly alerted of the test schedule and cost breaches and their impact on the combat system's planned production decision review in December 1990, according to the IG. In comments submitted with the IG report, the BSY-2 program manager asserted that there was no specific requirement to baseline changes. As a result, the IG recommended the Navy Acquisition Executive submit to the DAE a program deviation report regarding the schedule and cost baseline breaches on the BSY-2 system. The Navy eventually complied with this reporting.

In the case of the Navy SLAM program, the DAE requested SLAM performance parameters be added to the regular Harpoon baseline agreement, but the Navy never responded. The original performance parameters in the baseline are for an all-weather, anti-ship configuration of the Harpoon missile. SLAM performance parameters would describe the anti-fixed-target configuration of the Harpoon missile. As of Sept. 30, 1990, the Navy had not amended the Harpoon baseline agreement with the required SLAM performance parameters. "The performance parameters are still critical," says IG because "operational testing for the SLAM did not start until April 1990, and the full-rate production decision is scheduled for April 1991. As a result the DAE will not be promptly alerted, through the baseline reporting process, when performance problems occur that could impact the scheduled production decision."

According to Navy comments on the report: "the Harpoon/SLAM was specifically reviewed and mentioned in the audit as a program with baseline that the DAE had approved with contingencies.

Overall, the IG recommended that the Under Secretary of Defense for Acquisition, in coordination with the Navy and the Air Force, tighten up requirements for baseline agreements. According to the IG, lapses occurred because the Navy and Air Force did not submit DAE-requested additions to the baseline agreements, and the DAE did not establish a definite date for the services to submit outstanding program baseline agreements until May 30, 1990. In general, Navy officials commenting in the report concurred with IG recommendations and stated that the Service submitted to the DAE an AN/BSY-2 program baseline change that addressed all stated baseline breaches.

CANN: DON'T SPEED SUBMARINE DEVELOPMENT TO HELP INDUSTRIAL BASE PROBLEM

When asked during a House Armed Services seapower hearing last week if the process for choosing a Seawolf alternative submarine, a smaller and less expensive SSN design, could be sped up to quell industrial concerns, Gerald Cann, the Navy's top acquisition executive, replied that it would take at least two to three years for design work to be completed "but it won't represent what you want." A submarine program takes anywhere from 10 to 13 years to complete, Cann stated.

VADM. Roger Bacon, assistant chief of Naval Operations (undersea warfare) said that the low rate of initial production for the SSN-21 will not sustain the Navy's capability. "We need at a minimum three every two years," and warned despite present warming of international relations " we must resist the urge to undermine our undersea warfare programs and fragile industrial base for short-term fiscal gains."

DESERT STORM ESTIMATES DOWNRATE TOMAHAWK PERFORMANCE . . . begins page one

Tomahawk's first deployment, were misleading, and a growing duel over data -- and the way that it is measured -- is clearly a pretext to what will no doubt be a protracted and controversial inter- and intra-Service debate over the sufficiency of manned versus unmanned platforms -- for delivering ordnance and for other missions as well.

The 95% figure represents only the number of missiles that made it "out of the tube" without problems, a number of Navy sources have confirmed. At this early juncture in the assessment, the Navy's best estimates say that Tomahawk's actual mission effectiveness ranged somewhere between 75-85%, which

Navy sources point out "is still pretty damn good," as one Navy source put it. Navy sources also argue that the high percentage of missiles "to achieve cruise" -- that is, to demonstrate effective storage reliability and boost reliability by passing through the ignition/light-off stage without problems -- marks a significant achievement. Sources say that the 90-plus% success rate in this stage was better than the Navy expected. The missile had experienced problems on the testing range during the "critical" first 12 seconds of flight during which the booster brings the missile to its cruising altitude.

There are data, however, that suggest a success rate significantly lower, say other sources, who may want to publicize Tomahawk's shortcomings. Tomahawk detractors have reported a success rate possibly as low as 60 percent in terms of targets hit and destroyed. "The Navy's claims of 95 percent were very high even before the actual BDA [bomb damage assessment] was calculated," the source said. "Off the record, Navy officials have commented that Tomahawk only succeeded 85 percent of the time. But now it is actually being determined that its success rate is no higher than 60 percent," the source said. Navy officials, however, say that figure is "flat out wrong." Moreover, these sources say that the success rate for Tomahawk -- whether measured by either ordnance on target or target destroyed -- was "a helluva lot better than 65 percent," one Navy source said. "No Tomahawk went off and did anything stupid like land a half-mile away from a target," another Navy source close to the assessment process said. Those missiles that dropped out during the inertial guidance phase of the mission may have been shotdown, the source said, "or their engines just crapped out."

But Tomahawk critics retort: "Serious posturing is taking place and the Navy is very sensitive about revealing the mission success of Tomahawk if it looks less attractive than officials had originally estimated. Everything is so critical now when you are talking about getting funding and replacing those [missiles] you've used."

The confusion reflects the problems that "smart" weapons raise for conventional BDA methodologies. Sources close to the assessment process argue that one of the reasons definitive numbers have yet to be determined is that "exactly what constitutes an effective mission" is something that has yet to be worked out. "You can argue for two or three hours over what an effective mission is," one source said. For example: in the past, doing BDA required little sophistication. Targets got hit or did not get hit, turned to rubble or did not turn to rubble.

"But every Tomahawk was not intended to turn a target into rubble," a Navy source said. "We were just trying to put holes in some things." Cruise missile and other precision-guided weapons used in Desert Storm were employed "specifically to make things militarily ineffective" while limiting collateral damage, the source said. "If there was a 60 ft. antennae on top of a building and the missile was supposed to take it out, someone could come along, look at the BDA, see the building still standing and conclude that the target was not destroyed," the source said -- an incorrect conclusion. Accurate assessments will require an assessment of "specific levels of damage," the source said. The Center for Naval Analysis has undertaken a major study to determine what levels of damage were achieved versus those that were intended, the source said.

One defense analyst argued that "the questions to ask are all on operational effectiveness." Answers will "certainly have a large impact on what gets funded and what does not." The source said that analysts were "looking at the number of Tomahawk missiles launched by each launching platform; what targets were intended to be hit; the operational effectiveness by target. What worked best at hitting certain targets? And finally an analysis of the bomb damage assessment and why certain targets were missed and where Tomahawk was inaccurate and why?"

Navy sources say they are asking precisely those sorts of questions, but say that have yet to come to definitive conclusions because "we don't have conclusive results on every single target -- let alone every missile fired -- yet." During the war, there was "no reason to waste critical BDA assets way down in the weeds" to see whether second and third missiles hit a target that was rendered inoperable by a first missile. "If the thing stopped beeping, that was a hit," a Navy source said.

The first step in the BDA process now underway is "to consider each system in isolation," the source said. The assessment of Tomahawk's performance will have major implications for determining how much unmanned, stand-off weapons systems should be used in place of manned platforms. But assessors are not trying to determine whether Tomahawk is better than a manned aircraft at this point, rather, did it do what it was supposed to and "could we have used something else instead" that would have done the job better? Initial indications show that "we really needed all the systems," the source said, pointing out that a thousand pound warhead, like Tomahawk's, is not lethal enough to be used against all targets. But sources say that Desert Storm demonstrated that the lethality of the conventional Tomahawk was greater than expected given "the effect of the warhead and the afterbody" both doing damage to the target, a Navy official said.

Ultimately, the assessment data will be used to determine "resource allocation" in future wars, and in preparation for them, to ensure the "right mix" of military capability. At this stage, however, Navy sources caution that "there are still an awful lot of unanswered questions" and that "nobody has all the answers yet." -- *Kevin Dwyer and Laura M. Zabriskie*

Special Report on Emerging Naval Threats Part II

SPREAD OF SOPHISTICATED WEAPONS INTO THIRD WORLD COMPLICATES NAVY'S ROLE

The proliferation of sophisticated weapons into the hands of Third World powers as well as terrorists, drug lords and insurgents suggests that during the 1990s, sheer quantities -- and not quality -- of firepower will become the primary factor distinguishing between levels of conflict around the world, according to an unclassified statement accompanying closed testimony by RADM. Thomas Brooks, the Director of Naval Intelligence (DNI) before the House Armed Services seapower and strategic minerals subcommittee earlier this month. With regional powers able to strike with a greater variety and volume of firepower than ever before and sub-regional and non-conventional powers continuing to improve their capabilities as well, the Navy's role of protecting U.S. interests is becoming increasingly more complex and dangerous, according to Brooks.

Increasing competition for hard currency within the world arms market has fueled a relative lack of concern over compromising technologies with either direct military or dual-use applications, says Brooks. Despite constrained defense budgets, Brook's Office of Naval Intelligence (ONI) expects little diminishment in Third World appetites for sophisticated weaponry anytime in the foreseeable future. "Prestige will continue to be a major consideration in the acquisition of new weapons, fueling demand for near state-of-the-art equipment despite cost," states ONI.

According to ONI, future worldwide patterns of arms transfers will likely be characterized by a large initial infusion of CFE surplus military hardware among Third World states followed soon after by a demand for increasingly sophisticated military hardware especially for naval and air forces. While sophisticated weaponry will be available from Soviet, former Soviet-bloc as well as other Third World manufacturers, Third World arms buyers will continue to look towards Western arms manufacturers for its best equipment.

While implementation of the Conventional Forces in Europe (CFE) Treaty has lessened tensions between the NATO allies and the Soviets, ONI asserts that in some ways its implementation has created arms control export problems of its own. Large quantities of Soviet equipment were withdrawn from Europe prior to treaty signature. Some of it has already been exported and more may be made available to anyone who can pay for it.

At the same time, ONI notes that "all Eastern European countries have substantial inventories of ground forces weapons to sell, either as a result of mandated CFE reductions or to keep domestic arms industries employed," states ONI. "The latter is an important consideration as new governments press to keep employment up, as well as to reduce balance of payments problems," the report maintains.

In addition to creating pressure for new and used hardware, it is also creating a surfeit of arms technicians and supply services for uprating existing inventories of tanks, aircraft and warships, according to Brooks. ONI believes Iraq used such aid to modify its East- and West-bloc weapons during its war with Iran. "In many ways, the idea of potentially hostile countries hiring such groups to modify existing inventory, or to create indigenous weapons, is more frightening than the purchase of specific weapons systems," the report asserts.

While naval equipment is not included in CFE reductions, most western countries are acting as if it were, states ONI. This is creating potential replacements for Third World naval equipment, much of which is approaching rustout. These include the Soviet Osa class PTGs and Romeo and Foxtrot submarines, U.S. Tang and Guppy submarines, Gearing and Sumner class destroyers as well as various ships of European origin. Replacement of these ships with newer, used Western ships and subs would represent a considerable qualitative upgrading for most of the fleets receiving them during this decade, stated Brooks.

LATEST NAVY READING SHOWS 70 NATIONS POSSESS SEA-SKIMMING ANTI-SHIP MISSILES

Over seventy nations currently possess anti-ship cruise missiles (ASCMs), says ONI. Of these, over thirty nations deploy the French Exocet missile, while nearly as many use the U.S. Harpoon. Other missiles include the Chinese Silkworm, the Norwegian Penguin as well as the Israeli Gabriel and its licensed South African and Taiwanese variants. These missiles cause a significant threat to Navy ships because of thei

DEPARTMENT OF THE AIR FORCE
UNITED STATES OF AMERICA
MCMXLVII

WHITE PAPER

AIR FORCE PERFORMANCE IN DESERT STORM

April 1991

Air Force Performance in OPERATION DESERT STORM

Everyone witnessed the success of the coalition Air Forces in Operation Desert Storm. From the early hours over Baghdad to the final minutes in Kuwait City, the United States Air Force proved it is the world's best. This effort did not just happen. It was the result of a concerted effort over the past twenty years -- twenty years of hard work and commitment to excellence. Quality people, quality equipment, quality training and quality leadership created this force and assured our success during Operation Desert Storm. Environmental impacts -- heat, sand and fine dust -- were less significant than anticipated. Aircraft, weapons, and ground and aircrews performed and survived even better than predicted. Motivated people proved that flexibility is the key to airpower. Ingenuity, cooperation with industry, and reliable weapons systems enhanced that flexibility. This report captures the flavor of USAF system and personnel performance in Desert Storm. It highlights the performance of a cross section of resources from combat aircraft and combat support to the role of Air Force engineers, logisticians, and space assets. It is not a comprehensive report on capabilities, but an initial report of how the "1100 hour war in the desert" was won.

Combat Systems

Much of the prewar debate centered around whether the military had the right doctrine, was buying the right equipment, and could operate effectively in a coalition force. Desert Storm showed that Air Force equipment and doctrine were up to the task. It also demonstrated the U.S. Air Force could integrate effectively into what was the largest coalition air effort since World War II. In this integrated air campaign, coalition air forces quickly gained and maintained air superiority. This achievement opened opportunities for coalition forces to employ the versatility of airpower to meet other military objectives. Airpower destroyed the Iraqi Integrated Air Defense system and those Iraqi pilots who chose to fly. After gaining air superiority, coalition forces proceeded to destroy the strategic industrial and military targets which keep a military running. Electricity, oil, communications, supply depots and transportation nodes are vital to any nation's ability to use military power. As these strategic targets were destroyed, coalition air forces focused their fire power on enemy forces on the battlefield;. The destruction of bridges, tanks, artillery, and other military hardware in the Kuwait Theater of Operations (KTO) demonstrated of how effectively this can be done with modern airpower.

Without air superiority, the full spectrum of airpower could not have been applied against the right targets to avoid casualties and leverage our high-tech advantages. Employing a single Air Tasking Order, CINCCENTCOM selectively employed his best platforms, armed with the most effective munition to attack the target. He used every joint and coalition asset to accomplish the war objectives. Desert Storm revalidated many doctrinal precepts. This war proved U.S. military forces had the quality people, equipment, leadership and training required to fight and win. By employing assets in a well-conceived plan, Desert Storm was won and Kuwait was again free.

As was demonstrated, airpower offers the ability to quickly and quietly respond to any crisis. F-15s were flying defensive patrols along the Iraqi-Saudi border 7000 miles from their departure bases within 38 hours of notification to deploy. Within five days strategic airlift moved five fighter squadrons, a contingent of AWACS, and an 82 ABN Brigade to the CENTCOM area of responsibility (AOR). Within 35 days, the Coalition Air Forces had a fighter force that equalled Iraq's fighter capability. The global reach of the Air Force allowed the United States to mass its military power rapidly and to immediately project combat power in this part of the world. Once combat power was in place, it could either defend friendly areas or attack an adversary.

The Air Force flew over 65,000 sorties during Operation Desert Storm and accounted for 31 of 35 kills against fixed wing aircraft. The Air Campaign eliminated a minimum of 234 aircraft, including 120 that flew to Iran, without a single loss in air-to-air combat. The Air Force flew 59% of all sorties, with 50% of the assets and incurred only 38% of the losses. The mission capable rate for Air Force aircraft was 92% -- higher than our peacetime rate.

F-117 Before CNN's initial reports of the air war over Baghdad, the F-117 was a stellar performer. Dropping the first bomb of the war on an air defense control center, the F-117 provided us the advantage of surprise. Often the Iraqis would not start shooting until the bombs exploded. With the ability to cruise to the target, identify it before surface threats became active, and hit it with precision, the F-117 was an extraordinary fighter-bomber. Although it represented only 2.5% of the shooters in theater that first day, it hit over 31% of the targets. During the war, it flew almost 1,300 combat sorties, dropped over 2,000 tons of bombs, flew over 6,900 hours and demonstrated accuracy unmatched in the history of air warfare. The value of the F-117 was that it combined stealth technology and precision delivery. With the use of tactical surprise, the F-117 helped assure air superiority over the Iraqi skies as it destroyed command and control capabilities, the Iraqi Integrated Air Defense System, aircraft shelters, and valuable strategic targets in Baghdad and Iraq. Baghdad was more heavily defended than the most highly defended Warsaw Pact sites in Eastern Europe during the height of the Cold War. The F-117 was the only aircraft to operate in this environment over downtown Baghdad. Precision delivery assured the F-117 could destroy those targets in a single mission with great lethality. Despite its heavy use, the F-117 had a mission capable rate of 85.8% for the war -- 4% higher than in peacetime.

F-15 During Desert Shield, F-15s provided the defensive umbrella that permitted the deployment of air, land and sea assets into the AOR. After D-Day, they shifted to offensive counterair attacks against Iraqi Air Force and helped gain air supremacy within the first ten days of the war. Every Iraqi fixed wing aircraft destroyed in air-to-air combat by the Air Force was a "kill" for the Eagle. Their success permitted coalition air forces to exploit the versatility of airpower over the entire battlefield. The 120 F-15 C/Ds deployed to the Gulf flew over 5,900 sorties and maintained a 94% mission capable rate -- 8% higher than in peacetime.

F-15E Forty-eight of these multirole fighters were deployed to the Gulf. The F-15E's flexibility was the key to its success. The F-15E proved its versatility by hunting SCUD missiles at night, employing laser systems to hit hard targets and attack armored vehicles, tanks and artillery. It proved unusually effective with the Joint Surveillance Target and Attack Radar System (JSTARS) for cueing on SCUD locations and using Low Altitude Night Infrared Navigation System (LANTIRN) to locate and destroy the missiles and launchers. Its overall mission capable rate was 95.9% -- 8% higher than in peacetime. These aircraft deployed with

LANTIRN navigation pods (permits accurate navigation at night across featureless terrain to the target area without the need for active navigation aids). . Subsequently the targeting pods were deployed. During Desert Storm, the F-15E accomplished Operational Test and Evaluation of the LANTIRN system with spectacular results. Their primary targets were SCUDs, command and control links, armor, airfields and road interdiction. While flying over 2,200 sorties, only two were lost in combat.

A-10 The Air Force deployed 144 A-10s into the AOR. Although flying only 30% of the sorties, A-10s achieved over half the confirmed bomb damage assessment (BDA) damage and fired over 90% of the Mavericks. Air superiority allowed innovative employment of A-10s in a variety of roles. Primarily killing tanks in an interdiction role, the A-10 proved its versatility as a daytime SCUD hunter in Western Iraq, suppressing enemy air defenses, attacking early warning radars, and even recorded two helicopter kills with its gun -- the only gun kills of the war. While the A-10 flew almost 8,100 sorties, it maintained a mission capable rate of 95.7% -- 5% above its peacetime rates. Despite numerous hits and extensive damage, the A-10 proved it could do a variety of missions successfully.

F-111 Turning in an outstanding performance, the F-111 again proved itself to be a workhorse not only in the interdiction and strategic attack roles but across the spectrum of ground attack missions. With its FLIR (Forward Looking Infrared) and laser designation system, the F-111F attacked key military production facilities; chemical, biological, and nuclear sites; airfields, bunkers, C3 assets, and portions of the integrated air defense system with great success. Attacking bridges, hardened aircraft shelters, and individual tanks, armored vehicles, and artillery, it was a stellar performer. In what became known as "tank plinking" the F-111s were credited with over 1500 verified armor kills. In over 4,000 sorties the F-111 had a mission capable rate of over 85% -- approximately 8% higher than peacetime rates. One Wing Commander reported that his unit flew over 2100 sorties with no maintenance non-delivers. These platforms delivered the precision munitions on the manifolds which stopped the oil Saddam was dumping into the Gulf. Overall, the F-111 proved to be a versatile, precise, survivable platform which made significant contributions to the success of the air war.

Electronic Combat With EF-111s Ravens and F-4Gs Wild Weasels, the Air Force blinded Iraq's Integrated Air Defense System. The 18 EF-111s in the AOR flew over 900 sorties with a mission capable rate of 87.5%; and the 48 F-4Gs flew over 2,500 sorties with a 87% mission capable rate. Because the Iraqis feared the F-4G and its HARM missile, they made brief, limited and ineffective use of their radars. When they did choose to operate these radars, the effective jamming of the EF-111 negated their ability to track, acquire, and target attacking aircraft. Every day the Weasels and Ravens supported shooters as they attacked their targets in Iraq and the Kuwaiti Theater of Operations (KTO). One sign of their success was that after day four, all allied aircraft operated with impunity in the mid to high altitude environment across the AOR. By decreasing the threat of SAMs to our strike aircraft, EF-111s and F-4Gs permitted aircraft to deliver their weapons from an environment where they can be very lethal.

F-16 The F-16 Fighting Falcon proved itself to be a versatile platform which can attack targets day or night -- in good or bad weather. Two hundred and forty-nine F-16s were deployed to the Gulf. These aircraft flew almost 13,500 sorties -- the highest sortie total for any system in the war -- and maintained a 95.2% mission capable rate -- 5% above its peacetime rate. F-16s attacked ground elements in the KTO, flew SCUD missions, and destroyed interdiction targets, such as military production and support and chemical production facilities, and airfields. The 72 LANTIRN capable (Navigation pods only) F-16s were a real success story. LANTIRN's mission capable rate was over 98%. Past emphasis on reliability and maintainability paid dividends here.

B-52 The role of the large conventional bomber was revalidated in the Gulf war. B-52s flew 1,624 missions, dropped over 72,000 weapons, and delivered over 25,700 tons of munitions on area targets in the KTO, and on airfields, industrial targets, troop concentrations and storage areas in Iraq. Despite being over 30 years old, the B-52 had a mission capable rate of over 81% -- 2% higher than its peacetime rate. B-52s dropped 29% of all US bombs and 38% of all Air Force bombs during the war. Through effective modification of the B-52, it remains a useful platform. As Iraqi prisoners report, B-52 raids had devastating effects on enemy morale. Estimates show that from 20 to 40% of troop strength had deserted their units prior to the G-Day. While fighters employed precision guided munitions to destroy pinpoint targets, the B-52s successes demonstrated the need to preserve the large conventional bombers' ability to destroy large area targets.

Special Operations Elements of all AFSOC units deployed to Desert Storm and performed a variety of missions, including infiltration, exfiltration, and resupply of Special Forces Teams on direct action missions; rescue of downed crew members; psychological operations (PSYOPS) broadcasts; dropping 15,000 pound bombs; and supporting counterterrorist missions. Over 50 SOF assets were deployed, including helicopters and AC/EC/MC/HC-130s. These assets flew over 830 missions to support CENTCOM. SOF crews recovered downed crew members and provided valuable target identification and human intelligence (HUMINT) work. MH-53J Pave Lows also acted as a pathfinder for the Army Apaches that attacked the radars in Iraq during the first hours of the war. One AC-130 was lost during the war.

The individual performance of Air Force aircraft was overshadowed by the people who fly and maintain these aircraft. Their accomplishments reflect the pride, professionalism, and skill of a well trained force which had the right equipment to counter modern battlefield threats and was led by leaders who understand how to employ those forces. This coupling of quality equipment and well trained people led by visionary leaders who understand how to apply airpower is the real success story of Desert Storm.

Munitions and Missiles

Aircraft get you to the target area, but effective munitions destroy the targets. Vital centers of industrial power were vulnerable to pinpoint attacks. Military equipment and infrastructure were destroyed across the width, depth and breadth of the battlefield with impunity and at a time of our choosing. Once air superiority was gained, every sanctuary and every prerogative was vulnerable to airpower. The success of the F-117 during the first few hours to blind and incapacitate the Iraqi military was the death knell in this war.

Precision Guided Munitions (PGMs) Denying the enemy sanctuary has always been a goal of airpower, and magnifies the effectiveness of an air campaign. U.S. pilots used 7,400 tons of precision munitions with deadly effectiveness. Approximately 90%

were dropped by the Air Force. F-111s employed GBU-12s to destroy over 150 armored vehicles a night during the last few weeks of the war. F-117s used GBU-27s to hit hard targets such as aircraft shelters, bunkers, and other strategic targets in Baghdad. F-111s and F-15Es used GBU-24s to destroy chemical, biological and nuclear storage areas, bridges, aircraft shelters and other strategic targets.

Precision munitions highlight the lethality of modern airpower. On several occasions, a two-ship of F-15Es with 16 bombs destroyed 16 tanks. When one bomb equals one shelter or a tank -- the message quickly spread that every sanctuary had been eliminated by airpower. After the commencement of the shelter campaign, Iraqi pilots voted with their afterburners to get out of the war. But, not every target requires a precision weapon. The ability to use the right weapon on the correct target shaped the outcome of the air war. When it was important to avoid collateral damage, civilian casualties, or to directly hit a target, PGMs were the right choice. F-117 attacks over Baghdad demonstrated the ability to precisely kill military targets while minimizing civilian casualties.

Maverick The Maverick missile, used by the F-16 and A-10, attacked armored targets. This missile has continually been upgraded to handle new threats and targets. The imaging infrared radar (IIR) Maverick's performance was crucial in the armor war. Since it only took one missile to destroy each Iraqi tank, a $70,000 Maverick equated to a $1.5 million T-72 tank. It is important to note that Iraq had more tanks than Germany and Great Britain combined. It was the fourth largest army in the world. Maverick, an older system which had been continually modified to keep pace with modern war, played a large part in the destruction of that significant military force.

AIM-7/AIM-9 The AIM-7 proved to be an effective air-to-air weapon. Twenty-three enemy fixed wing aircraft were downed by AIM-7s. Through an aggressive product improvement program, the AIM-7 has become a more lethal weapon with a bigger launch envelope. The AIM-9 destroyed six enemy fixed-wing aircraft, and worked as advertised.

High Speed Anit-Radiation Missile (HARM) Its hard to assess the success of the HARM missile due to the Iraqi tactics used to counter it. The Iraqis understood that if a radar went on, a HARM was on its way. This deterrent kept them from using their operable radars and control centers. Throughout the war, surface-to-air missile (SAM) sites would turn off their radars after launching missiles, leaving SAMs unguided as they flew toward their targets. Lethal SEAD (Suppression of Enemy Air Defenses) permitted us to operate from the mid to high altitude where aircraft were beyond anit-aircraft artillery (AAA) range.

Deployment, Sustainment and Resupply Efforts

Airlift, tanker support, prepositioning of supplies, and a large, modern, base infrastructure permitted movement of forces into the AOR, and provided the ability to operate quickly from Saudi Arabia. These forces assured we had the "global reach" and support to exercise "global power."

Strategic Airlift Desert Storm was the largest airlift since World War II. Airlifters moved combat forces half way around the world. By the cease fire, airlift had moved over 482,000 passengers and 513,000 tons of cargo into the AOR -- the equivalent of moving Oklahoma City, all of its people, all of its vehicles, all of its food, and all of its household goods halfway around the world.

Air Force C-5s and C-141s, moved 72% of the air cargo and about one-third of the people while commercial augmentation moved the rest. C-5s were 90% and C-141s 80% committed to Desert Storm. The remainder of Air Force airlift flew other high priority DOD missions to the rest of the world. This operation was the first time in its 38 year history that the Civil Reserve Air Fleet (CRAF) was activated. On 18 August, the first stage of CRAF, 18 passenger and 23 cargo aircraft, was activated. When fighting commenced, the second stage, 77 passenger and 40 additional cargo aircraft, were activated. These commercial carriers provided additional airlift capacity needed to meet CENTCOM's requirements. These commercial aircraft carried the majority of the troops to the AOR.

Strategic airlift forces have been going at full speed since Desert Storm started and will continue until our forces are redeployed home. Airlifters with Airlift Control Elements were the first to land in the Arabian Peninsula and will be the last to leave.

Many of these people are Guardsmen and Reservists who have twice demonstrated their patriotism during the past 18 months -- in Panama and now the Arabian Peninsula.

Air Refueling The rapid deployment of fighter aircraft to Saudi Arabia resulted from Air Force tanker capability. Within 38 hours of the deployment notice, the first F-15 aircraft had landed in Saudi Arabia and were ready to defend the Persian Gulf area. The Strategic Air Command deployed 256 KC-135s and 46 KC-10s into the AOR during the war. In Desert Shield, tankers flew 4,967 sorties and 19,089 hours, refueled 14,588 receivers, including 5,495 Navy and Marine aircraft, and offloaded 68.2 million gallons of fuel. Tankers surpassed this effort during the six weeks of Desert Storm when they flew 15,434 sorties, logged 59,943 hours, refueled 45,955 aircraft and offloaded 110.2 million gallons of fuel. Approximately 20% was used for Navy and Marine receivers. Every aircraft -- fighter, bomber, airlift, AWACS, or JSTARS -- and every service and some allies used Air Force tankers to do their mission. One F-15 pilot commented about tanker accessibility: "There was more gas in the sky over Saudi than in the ground below" -- a testimony to the tanker force. No other nation has such a capability.

Prepositioning and Base Infrastructure Saudi Host Nation Support was superb. During the past decade, whole bases were built, stocked and prepared for war. These locations made it easy for forces to quickly move from a deployment phase to full combat operations. The Gulf Cooperation Council provided fuel and many other materials. In other locations, the Air Force operated from open runways. There, civil engineers literally built cities on the sand. During the past decade, the Air Force developed tents, hospitals, supply areas, ramps and other base essentials had been developed as modular buildings. This investment guaranteed operation from austere locations anywhere around the globe. Afloat and ashore prepositioning included bare base and fuels equipment, supplies, vehicles, and munitions which were required to sustain and project Desert Storm forces. These supplies saved an estimated 1,800 airlift missions to the AOR and provided prepositioning of supplies and base infrastructure for 21 principal airfields.

Theater Airlift Over 145 C-130s deployed to support Desert Storm. These aircraft moved units forward as they deployed into the theater. From 10 August to the 2 April, C-130s flew 46,500 sorties, logged over 75,000 hours, and moved over 209,000 people and over 300,000 tons of cargo. Once the fighting started, they provided logistical support, medical evacuation of wounded, and battlefield mobility through airland and airdrop. During the ground campaign, C-130s flew over 500 sorties a day. During Desert Storm, C-130s had a mission capable rate of 84% -- 6% higher than in peacetime.

Command and Control

Desert Storm employed a wide variety of new Space and Intelligence assets to ease mission planning, command and control of the air war, provide real-time identification of ground targets for shooters, and assure the coalition gained and maintained the initiative. Both space and intelligence platforms were force multipliers in Desert Storm.

Desert Storm was America's first comprehensive Space war. The prudent investments of the past decade were justified as space provided weather information, reliable navigation support, warning of possible threats, and secure, rapid communications. Until recently, space focused primarily on providing strategic warning, surveillance, communications and arms control verification. Today, even the tactical commander realizes the benefit space assets provide to conventional warfare.

Defense Meteorological Support Program DMSP assured commanders had high resolution, near real-time weather information about sand storms and other unusual phenomena in the Gulf area, and could accurately predict target weather throughout the war. DMSP was crucially important this year as the weather over Baghdad and Kuwait was the worst in the last 14 years. It also provided the first glimpses of Saddam's ecoterrorism of the Gulf waters and its air. CINCCENTCOM and his staff fully integrated these capabilities into their planning and execution of the war effort.

Global Positioning System (GPS) Without reliable navigation, no precision weapon could have been employed. Aircraft must get to the target area before they can effectively use their weapons. GPS provided accurate guidance to the target area for air, land

and naval forces. Although the whole constellation will not be completed until FY93, American forces had three-dimensional coverage for 20 hours a day, and two-dimensional coverage 24 hours a day. GPS provides the Air Force with the ability to traverse all parts of the globe to deliver precision munitions.

Defense Satellite Communications System (DSCS) Throughout history, communication has been a shortfall during war. The need to communicate easily and securely is crucial to prosecuting military operations. During Desert Storm, DSCS was the workhorse providing both inter- and intra-theater communications. With over 100 ground tactical terminals to support theater operations, the Air Force was able to provide a full range of secure and non-secure voice and data capability to Desert Storm commanders. Even though the communications requirements increased by a factor of thirty, DSCS assured our tactical commanders had the ability to communicate wherever and whenever they wanted. Overall, the first space war was an unqualified success.

Just as Space played a significant role in this war, our Intelligence assets changed the way we prepare for war and fight. Four systems -- the Mission Support System, Tactical Digital Facsimile, AWACS, and JSTARS -- provided timely information and support for air, ground and naval forces during Desert Storm.

Mission Support System This system provided integrated mission planning support for Air Force pilots. While it took a couple of days to plan a mission in Vietnam, it was now possible to prepare a pilot for a mission in four hours. Charts, maps, threats, and other vital data were integrated through this system into every squadron involved in Desert Storm. Through its reliability, it became a command and control asset for planners in the CENTCOM staff. Many units found innovative and creative ways to better use this asset.

Tactical Digital Facsimile Crucial to crews and commanders, it provided the capability to send high resolution pictures and other data. It is a secure, reliable, and versatile force multiplier which can relay near real-time data vital to combat success to the pilot. Much maligned before the war, the investment was well worth the money. The TDF was today's telephone to the modern battlefield commander.

AWACS From 16 January to the cease fire, AWACS flew four continuous orbits to control over 3,000 sorties a day. Despite multiple Air Forces and languages involved in the coalition, not one instance of friendly air-to-air fratricide resulted -- a tribute to AWACS effectiveness. It was an AWACS vector which positioned the Saudi F-15 to kill his two F-1s. Just as it patrolled the Persian Gulf skies from 1980 to 1989, AWACS proved to be an invaluable asset to control the air war. It was very effective in target pairing and declaring hostile threats.

JSTARS This program had not finished its Developmental Test and Evaluation prior to its deployment to Saudi Arabia in mid-January. JSTARS proved to be a spectacular success. These two test aircraft flew 54 combat sorties and supported 100% of mission taskings with a system availability rate of over 80%. JSTARS tracked everything that moved on the ground. From D-Day to G-Day, JSTARS operators logged over 535 hours to locate, identify and target assembly areas, POL storage sites, SCUD areas and missiles, convoys, trucks, tanks, and even SAM sites and artillery for Allied fighters. Coupled with F-16s, JSTARS enhanced the kill box approach to air interdiction which proved so effective in destroying Iraqi equipment in the KTO. When used with F-15Es, F-16s and F-111s, JSTARS effectively denied the enemy its night sanctuary and kept continual pressure on ground troops in the KTO. A mission on 13 February proves this point. During a 10.9 hour flight, JSTARS detected over 225 vehicles -- more than it had fighters to attack. Every commander agreed it was a spectacular success.

The large investments in intelligence and space assets to provide command and control over the battlefield and to provide information for all coalition forces were wise expenditures of taxpayer money. Lives were saved, assets better employed, and the full weight of joint forces were demonstrated in Operation Desert Storm. These initial efforts to merge new command and control capabilities with near real-time data will define the modern battlefield of the future.

Combat and Logistical Support Efforts

Civil Engineering and Community Services Support The Air Force is a self contained community. Most city services, like road repair, building maintenance, meals, housing, and office space are provided by the Civil Engineers and Community Support Personnel. During Desert Storm, these people erected over 5,000 tents, constructed over 300,000 square feet of hard-wall facilities, laid over 500,000 square meters of concrete and asphalt, and served over 20 million meals. The beddown of over 1,200 aircraft and its personnel was a major achievement. Approximately 9% of all personnel deployed to the AOR were in Civil Engineering and Services. In one instance, they built a base from the ground up in forty days. As one Wing Commander noted "the tallest thing on the base when we got here was the two inch high taxiway lights." RED HORSE, PRIME BEEF, and Saudi contractors worked around the clock to build the base areas -- 380 tents, four field kitchens, a 50-bed hospital, tactical field laundry, 19 latrine/shower units, and a tactical field exchange. They even had to bring electrical power to the base. Without this support, aircrews at these bare bases could not have performed their mission.

Medical Support Just six days after the invasion of Kuwait, the first Air Force squadron medical elements and Air Transportable Clinics left for Saudi Arabia. In a very short time, the largest projection of medical personnel in American history was assembled in the Gulf. The first of 15 Air Transportable Hospitals arrived in theater within the week and was ready to receive patients within 24 hours. These 50 bed hospitals, together with a 250 bed contingency hospital, were the primary Air Force medical support in the theater. In Europe, four USAF Contingency Hospitals with 3,250 beds were prepared, staffed and ready for casualties while 2,178 beds were available in CONUS. Over 6,200 active duty medical personnel and 5,500 from the ARC deployed to Europe or the AOR. The Reserve forces also made a significant contribution in CONUS by augmenting medical treatment facilities with over 6,600 personnel. During Desert Shield and Desert Storm, almost 48,000 patient visits were made in the AOR.

Modifications and Logistical Audibles During combat, new operational threats and requirements arise which must be countered. During Desert Storm, the Air Force worked hard to shorten the time needed to meet new operational requirements. A rapid response process reduced the 2 to 12 year requirement process to less than six months for urgent and compelling needs. Fourteen percent of these requirements were for new capabilities unique to Desert Storm, while the remainder enhanced current warfighting capabilities. By using or adapting off-the-shelf equipment, the Air Force minimized risks with these systems. Through this system, many changes were made to upgrade computer software for aircraft and support equipment.

Areas for Improvement

Regardless of the plan or the preparation, nothing ever goes as planned. This war was no exception. Clausewitz called these the "frictions" of war -- those forces which impede you from doing your job. One area involved the use of systems which the military cannot use during peacetime training -- to use them would compromise their capabilities. In Desert Storm some of these systems needed adjustments, but the deficiencies weren't known until the equipment was tested in the AOR. Quickly adjusted, these systems worked as advertised. Another area dealt with training munitions during the deployment phase. The Air Force did not deploy with sufficient training munitions. Without these assets, the ability to conduct training during the build up was limited.

Overall, BDA was a problem. It was not always timely. In addition, the Video Tape Recorders in many fighters did not have sufficient quality to permit accurate BDA. Less than half of all air-to-air kills could be confirmed through this system. The principal data recorded related to ground attack -- buildings, bridges, airfields, storage areas, tanks, artillery, trucks and armored personnel vehicles. Although these video recorders provided much of that data, with further refinement, new recorders could help overcome the BDA problems noted during the war.

Finally, tactical intelligence support was not always timely. Commanders complained about the excessive time it took to receive information at the units and the shortage of tactical reconnaissance assets. As we have increased the tempo and decision cycle of war, the ability to analyze post mission data has not kept pace. Intelligence at the theater level to support the mission with AWACS and JSTARS was excellent; but work is needed to ensure reliable, timely BDA.

These problem areas will not be the only ones which occured during Desert Storm; they are only the initial impressions of areas where we could have performed better. As we continue to study and dissect the lessons learned in the war, others problems will appear.

Summary

The Air Force's success in Desert Storm stems from quality people, equipment, training, and leadership. Today's airman is the best that has ever been recruited. Articulate, bright, and innovative, these people willingly accept responsibility, and operate sophisticated equipment with skill and pride. They are team players. An incident during the war will highlight this team effort . One F-15 Wing Deputy Commander for Operations praised the efforts of the only maintenance person available when his wing's aircraft arrived at a remote base: "The aircraft had to be turned and put on status, so the Chief did the only thing he could do under the circumstances -- he enlisted cooks, cops and engineers, and had every aircraft ready to go inside an hour." This example attests to the fighting spirit and flexibility of Air Force people during the war. Numerous other examples abound as well.

The Air Force today has the "global reach" and the "global power" to support national security objectives. These comprehensive forces can exploit the speed, range, flexibility, lethality and precision of modern airpower. Desert Storm reflects a commitment to recruiting quality people, providing them with the best equipment and technology available, training them until they gain confidence in their ability and their equipment, and giving them quality leaders to direct them. This formula was a winner in this war. Realistic training at Red Flag and other exercises prepared both pilots and support personnel for war and they performed magnificently. When coupled with innovative planning, aggressive leadership, and near flawless execution, Desert Storm was an unqualified success.

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Air-Launched Antitank Missiles

During the 1970s, the U.S. Air Force, Army and Navy set out to spend over $13 billion on precision weapons designed to kill tanks and other battlefield targets.[1] The only survivors of this program were the Army's Hellfire antitank missile, and the Air Force's Imaging Infrared (IIR) Maverick missile. Both of these weapons are designed to kill tanks from long ranges, allowing pilots to avoid exposure to enemy ground fire. They were also designed specifically to perform close air support under conditions of darkness and adverse weather.[2] Close air support is the use of airborne firepower to aid friendly troops closely engaged with the enemy. Positive target identification is crucial in close air support to avoid killing friendly troops intermingled with the enemy.

So far, in three cases of mistaken identity, these weapons have caused 10 of 20 U.S. combat fatalities in Desert Storm to date.[3] All of these mishaps occurred at night, in intense ground combat. Pentagon officials contend that despite the difficulty of target identification, close air support can be accomplished with missiles, if the pilots receive sufficient training. Unfortunately, little training is done with missiles due to their expense. Maverick and Hellfire missiles cost $74,317 and $40,106 per shot respectively.[4] A-10 pilots, for instance, only fire one Maverick missile per year, and this shot does not simulate the conditions of any likely close air support mission.[5]

The Maverick and Hellfire missile systems are not the only means of destroying tanks in close quarters with friendly troops. High-power cannons, carried by jet aircraft, can reliably destroy the most heavily armored tanks without coming within range of enemy antiaircraft guns.[6] These guns can destroy tanks for $365, a fraction of the cost of a sophisticated missile.[7] This is an advantage not only in wartime, but in peacetime as well - for the same amount of money, a pilot could take one practice shot with a Maverick, one or two with a Hellfire, or *two-hundred and three* shots with the GAU-8 Avenger. The Avenger is also more flexible in that it can either be fired from long range, or short range. Thus, in cases where identification is not an issue, it, like missiles, can remain safe from ground fire.[8] If positive identification is required, the Avenger can be fired from as close to the target as desired, something the Maverick missile cannot do.

The Maverick Missile

Price: **$74,317 per missile**

Mission: **To destroy hardened targets (bunkers, tanks and armored personnel carriers) from a distance of 6 to 10 miles. The Maverick can be used day or night.**

Date First Deployed: **Circa 1970**

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[1]. Status of the Air Force's Maverick/Close Air Support Weapon Systems Program, Comptroller General's Report to the Congress, General Accounting office PSAD-78-34, 4/4/78, p.i

[2]. Ibid

[3]. Storer H. Rowley & Nicholas M. Horrock, "Allies Reported Set for Ground War", Chicago Tribune, 2/18/91, p.1, and Rick Atkinson, "U.S. Raids in Kuwait Intensify; POWs Taken, The Washington Post, 2/21/91, p.A1

[4]The Maverick and Hellfire missile prices come from Procurement Programs (P-1), Department of Defense Budget for Fiscal Year 1991, Office of the Comptroller, DoD.

[5] Lt. Col. David Evans, USMC (ret), "From the Gulf", Naval Institute Proceedings, January 1991, p.80

[6]. David Hughes, "Syracuse Wing Finds F-16A Effective in Close Air Support", Aviation Week & Space Technology, 6/18/90, p.36

[7]. According to sources, on average, a GAU-8 fires about 35 rounds to kill a tank. DoD last purchased GAU-8 ammunition under a 1987 contract, at $10.42 in adjusted 1990 dollars. Thus, one burst costs $365.

[8]. David Hughes, "Syracuse Wing Finds F-16A Effective in Close Air Support", Aviation Week & Space Technology, 6/18/90, p.36

Comments: The basic design of the IIR Maverick missile makes it difficult for pilots to identify targets, which is crucial in close air support. The pilot must find his target in a blurry infrared image on a small screen in his cockpit. He must do so while flying at 500-600 mph, often several miles from his target. Pilots liken this process to driving down an expressway while looking through a drinking straw. Even with the help of pilots flying over the battlefield in slow observation aircraft, Mavericks have killed seven American servicemen by mistaking their armored vehicles for attacking iraqi vehicles.[9]

While the details surrounding the deaths of the seven Marines are not yet available, there has long been concern that Mavericks might cause such accidents. In particular, infrared images may not be sufficient to distinguish between friendly and unfriendly forces. The General Accounting Office observed in 1978:

> "Although the Air Force and OSD [the Office of the Secretary of Defense] have concluded that the IIR [imaging infrared] guidance concept is feasible, there is uncertainty as to the unit's capability in an operational environment. IIR guidance alone does not provide [accurate] target identification and this could limit the use of the IIR Maverick for close air support missions in situations where friendly and enemy forces are intermingled."[10]

The Maverick, while it allows the pilot to see at night and in bad weather, does not allow him to use his most accurate sensor - his eyes, when lining up a target. The Maverick missile must be launched from a distance of at least 3,000 ft.[11], a distance at which a tank is very difficult to positively identify. Otherwise, the Maverick will not have time enough to stabilize and home in on its target. Since the aircraft carrying the Maverick may be flying as fast as 600 mph, the pilot will have to identify his target at a range of 11,000 ft if he is to have ten seconds to line it up and fire. While it is considered extremely difficult to positively identify a tank at 3,000 ft., it is virtually impossible at 11,000 ft. Thus, day or night, in good weather or bad, the pilot firing a Maverick must rely on others to help identify his target.

Without being able to use his eyes, and unable to get a clear picture from his infrared camera, the pilot must distinguish between friend and foe by relying on what experts call "deductive recognition and identification." This amounts to an educated guess based on a more or less complete patchwork of information. The information is provided by the pilot's own view of the situation, and input from "forward air control" pilots, and troops on the ground. While forward air controllers have been used in Desert Storm, it is unclear whether such a forward air controller cleared the launch that killed seven U.S. Marines. In any case, a forward air controller, or forward observer can only describe verbally the battlefield situation. The pilot still has to see well enough to understand what the observer is telling him, and this can be very difficult in a battle obscured by smoke and fire, from two miles away.

The Air Force has argued that these target identification problems are not significant most of the time. The GAO stated that:

> Air Force officials said that the majority of the IIR Maverick's targets (about [classified] percent) occur behind the forward edge of the battle where friendly forces would not be located, positive target identification is not required, and deductive recognition of targets has been demonstrated.[12]

This statement is noteworthy for two reasons: The IIR Maverick was funded with funds from the Close Air Support Weapon System program. Shooting at tanks not engaged with friendly troops is not close air support, but rather tactical bombing. Second, the Army's current doctrine, the AirLand battle, specifically emphasizes engaging the enemy's rear areas, rather engaging him in the forward edge of battle area. Thus, friendly troops will likely be encountered in the areas in which the Maverick is designed to be used freely.

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[9]. Rick Atkinson & Barton Gellman, "U.S. Confirms 'Friendly Fire' Killed 7 Marines", The Washington Post, 2/4/91, p. A1

[10]. Status of the Air Force's Maverick / Close Air Support Weapon Systems Program, General Accounting office PSAD-78-34, 4/4/78, p.32

[11]. Ken Fireman, "The Maverick's Limits; Missile That Killed 7 Marines Risky in Close Combat", Newsday, Nassau & Suffolk Edition, 2/8/91, p.14

[12]. Status of Air Force's Maverick/Close Air Support Weapon Systems Program, Op cit., p.32

The Hellfire Missile

Price: $40,106

Mission: To destroy tanks from a safe distance, day or night, in good or bad weather, while supporting U.S. troops engaged in close combat

Date First Deployed: 1985

Comments: The Hellfire is carried by the AH-64 Apache attack helicopter, and is its only antitank weapon. It is designed to be fired at tanks almost 4 miles away. The Hellfire finds its way to its target by homing in on a laser beam shining on the target. That laser can be projected by the Apache, another aircraft, or by a soldier on the ground. The Apache is equipped with a sophisticated target viewing system, designed to afford a detailed picture of battlefields perhaps ten miles away, day or night, and in good or bad weather. Thus, in theory, the Apache can hover safely out of range of gunfire, and precisely select enemy tanks for destruction by the Hellfire, or fire at targets designated by ground troops, or forward air controllers.

Despite these advanced systems, Apaches and Hellfires recently killed two American soldiers, and destroyed two U.S. armored vehicles, while performing exactly the kind of mission for which they were designed. In an engagement with Iraqi ground forces, the Apaches worked in concert with U.S. tanks, artillery, TOW antitank missiles and infantry.[13] In all, over 100 Hellfire missiles were fired.[14] The results were the following:[15]

3 Iraqi Tanks
2 Iraqi Armored Personnel Carriers
1 Iraqi Multiple Rocket Launcher
2 Iraqi Bunkers

2 U.S. Armored Personnel Carriers

U.S. briefers did not elaborate on the details of which U.S. weapons scored what kills, but did say the Hellfire missiles were responsible for destruction of the 2 U.S. armored vehicles, and the resulting two deaths. Even if the assumption is that this $4 million, 100 Hellfire barrage[16] was responsible for killing all ten of these targets (8 Iraqi and 2 American), that would represent at best a one-in-ten kill rate. In other words, giving the Hellfire the benefit of the doubt, it scored only one kill for every ten missiles fired. And for every five kills, one was an friendly target.

If one assumes that each of the American weapons used - tanks, artillery, TOW missiles and Hellfire missiles - each killed two Iraqi targets, *the Hellfires would have destroyed one friendly target for every enemy one they destroyed.* While this theoretical scenario is necessarily crude, due to lack of information, it raises questions about the effectiveness of the Hellfire missile system. (DoD officials stated that the large number of Hellfire launches did not contribute to the U.S. friendly fire casualties.[17])

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[13]. Federal News Service, U.S. Central Command Briefing, 2/17/91

[14]. Rick Atkinson, "U.S. Raids in Kuwait Intensify; POWs Taken", The Washington Post, 2/21/91, p.A1

[15]. Federal News Service, U.S. Central Command Briefing, 2/17/91

[16] 100 Hellfires were launched at a price of $40,106. Hellfire missile prices come from Procurement Programs (P-1), Department of Defense Budget for Fiscal Year 1991, Office of the Comptroller, DoD.

Even if target identification problems can be resolved, the use of lasers to identify targets is not foolproof. Lasers can be obscured by many of the same means other light sources are obscured. In particular, most military vehicles are capable of producing smoke barriers, either from their engines, or by launching smoke grenades. This is in addition to the dust they create just by moving. Combat veterans point out that often, the only visible part of a tank moving across the desert is its antenna.[18] Furthermore, lasers can often be easily detected, and targeted, making survival of laser designators on the ground difficult. The GAO had the following to say about laser targeting:

> "Defense has proven the technical feasibility of laser-guided weapons, but has, however, identified numerous battlefield conditions which will deny the opportunity to use them or will degrade or defeat them."[19]
>
> "Numerous battlefield conditions may degrade the effectiveness of laser-guided weapons such as availability of adequate numbers of designators, survivability of designators, communications required between the ground or airborne observers and the strike aircraft, and the ability to designate the targets with the required accuracy and stability."[20]

Potential problems with laser-guided weapons may have been foreshadowed by a recent demonstration of the laser-guided Copperhead antitank missile in the Gulf. The Copperhead is a precision artillery round, designed to destroy tanks at a distance of over ten miles. This exercise resulted in three misses for three rounds fired. The first two rounds missed by twenty and forty meters respectively. Army personnel were unable to locate the third round.[21] The Copperhead, the Hellfire, the GBU-15 laser-guided bomb, and a laser version of the Maverick were all originally designed to use the same laser guidance system. There have likely been significant changes since then, however.

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[17]. Rick Atkinson, Op.Cit.

[18]. Lt. Col. David Ashel, IDF (ret), "Fighting Under Desert Conditions", Armor, November-December 1991, p.24

[19]. Status of Air Force's Maverick/Close Air Support Weapon Systems Program, Op. Cit. p.ii

[20]. Status of Air Force's Maverick/Close Air Support Weapon Systems Program, Op. Cit. p.19

[21]. John Mecklin, of the Houston Post, Pool Report, Transmitted via U.S. Newswire, Washington, 2/14/91

PROJECT ON GOVERNMENT PROCUREMENT

Briefings For Defense Reporters

From: The Project on Government Procurement Staff

Date: 2/15/91

This is part of a series of papers intended to prompt greater scrutiny of recent statements regarding the performance of weapons being used in Desert Storm. While early reports have declared the "high-tech" air war extraordinarily successful, there is not yet enough information to make a full judgement. Meanwhile, the allied bombing campaign does not seem to have achieved its objectives as quickly as planned. Prior to Desert Storm, an internal Air Force briefing for President Bush predicted that Iraq's overall combat effectiveness would be reduced by 50 percent within weeks of the allied bombing effort.[1] A Pentagon official recently said that, "'Nobody in his right mind' in the military hierarchy believes that allied forces have cut the fighting capability of Saddam Hussein's forces in half."[2]

These papers are not intended to criticize high-tech weapons performance, particularly since specific information about many systems has not yet become available. However, using the available information, this paper is intended to add some perspective to blanket statements that high-tech weapons have proven effective during the war. One such statement was recently offered by Defense Secretary Richard Cheney this week:

> **A decade of doom-and-gloom reporting made a lot of people forget that we do, in fact, lead the world in advanced technology. Now Americans are watching our Patriot missiles bust Scuds over Riyadh and Tel Aviv.**[3]

The following issues might be considered when evaluating reports on the Gulf war:

* To date the conflict is missing what military experts call "the fog of war" associated with a capable, aggressive enemy. Due to the Iraqis' limited air force capabilities, the allies have not had to cope with the mass confusion and chaos which occurs in most wars. So many high tech weapons, designed to fight in the more difficult circumstances created by resourceful enemies -- have not been tested in combat.

* An American aircraft mistakenly fired a Maverick missile at a U.S. vehicle, killing seven marines. Critics have long warned that the Maverick's design could cause incidents like this in heavy combat.[4] Meanwhile, a U.S. Cobra helicopter fired six TOW missiles before it destroyed one Iraqi armored personnel carrier.[5] The TOW is supposed to kill more heavily armored tanks with one shot.

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[1] Patrick E. Tyler, "Bush Doubts Air War Alone Will Defeat the Iraqi Military; Top Units Still Judged Able", The New York Times, 2/6/91, p.A1

[2] Ibid.

[3] Secretary of Defense Richard Cheney, in a speech before the U.S. Chamber of Commerce, 2/13/91, reported by Federal News Service.

[4] It should be noted that this incident occurred at night, when identification problems are at their worst. Nonetheless, Maverick missiles do not allow as much opportunity for accurate target identification as do other systems, such as anti-tank airborne cannons. We will soon publish a paper specifically on the Maverick Missile.

[5] Caryle Murphy & Molly Moore, "Attacks at Saudi Border Kill 12 U.S. Marines; Iraqis Lose 24 Tanks, Suffer 'Heavy' Casualties", Washington Post, 1/31/91, p.A1

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* The Patriot missile has achieved success against Scud missiles, which fall in predictable paths, and have been attacking in small numbers. The Patriot was designed for the much more difficult role of engaging multiple, maneuvering targets, where the enemy is constantly trying to attack the system in a variety of ways. The taxpayers paid substantial sums for these complicated capabilities. There has not yet been a chance to prove them.

* The U.S. has continuously bombed Iraq with aircraft and hundreds of Tomahawk cruise missiles -- with little interference from Hussein's air force. Yet, after nearly 70,000 sorties, nearly half of Iraq's aircraft shelters remain intact, and mobile Scuds continue to evade our attacks.[6] We may have dropped several times the amount of ordinance dropped in *all of World War II*[7], and yet Iraqi armored forces have only been reduced by roughly 30%.[8]

* According to an early briefing by General Schwarzkopf, over 790 sorties were required to attack 33 bridges. Apparently an average of 24 sorties were needed to attack *each bridge*. And there were three additional bridges targeted, but not attacked.[9] While this is not actually an exorbitant number, it contrasts with to the one-bomb-per-target image created by early strike footage released by the Pentagon.[10]

* General Tom Kelly has twice cited airplane shortages as a factor behind the military's inability to hit key targets such as Iraqi supply lines and mobile Scud missiles.[11] While military officials speak of crowded skies over Iraq and Kuwait, one should remember that *single raids* against Germany in World War II involved over one thousand aircraft each. We might have procured larger numbers of aircraft had they been cheaper. The U.S. Air Force overlooked high performance aircraft costing roughly $6 million each in procuring the complex $49 million F-15.

* Gen. Colin Powell, chairman of the Joint Chiefs, has stated that a key objective of the air campaign is to isolate and kill Hussein's forces. Perfect isolation/interdiction of enemy forces has occurred only three times in history, and in each of those cases, the U.S. suffered significant casualties. In these three World War II battles, the Japanese were *perfectly isolated* and heavily bombarded by battleships, which can lay down as much fire in an hour as 56 modern aircraft carriers, carrying a total of over 5,000 aircraft. While the Japanese troops, like the Iraqis, were heavily entrenched in defensive positions, the situations may not be comparable since this is a "high-tech war", and it is difficult to evaluate the resolve of Iraqi troops.

  Tarawa --- 3,300 U.S. casualties in three days
  Iwo Jima --- 26,000 U.S. casualties in three months
  Okinawa --- 49,000 U.S. casualties in three months[12]

* Aircraft losses may increase dramatically as we fly lower to engage moving tanks and other ground targets. Flying lower exposes our aircraft to Iraq's 8,000 anti-aircraft guns. The vast majority of our air losses in Vietnam were caused by guns. Heavy losses continue with British Tornado aircraft flying at low level. More Tornados have been lost

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[6] Gen. Tom Kelly, Defense Department Regular Briefing, Federal News Service, 2/13/91

[7] DoD has not released figures on total ordinance delivered, or ordinance dropped per mission. The total of the explosives used in World War II is compared to the destructive force of the Hiroshima and Nagasaki atomic bombs, which were roughly equivalent to 15,000 tons of TNT each. 70,000 sorties would allow many times that amount of TNT to be dropped on Iraq.

[8] Defense Department Regular Briefing, 2/14/91, Federal News Service.

[9] Schwarzkopf press briefing, 30 January 1991

[10] Also, bear in mind that some of these sorties are not bomb-carrying aircraft, but rather fighters providing air cover.

[11] Defense Department Regular Briefing, Federal News Service, 1/28/91. The comment was repeated in the 2/13/91 briefing.

[12] Figures taken from West Point history of WWII, and World War Two, by Liddell Hart.

than any other allied aircraft.[13]

- The 30-year-old B-52 strategic bomber is being used in Desert Storm. It's successor, the B-1B bomber, has not been deployed to the Gulf, and it is still suffering from lingering technical problems. After $30 billion spent, and four years since the last B-1B rolled off the assembly line, this aircraft is grounded and incapable of performing conventional missions now called for in the Middle East.

- Despite hundreds of millions spent and ten years of effort, the U.S. Air Force has no weapon comparable to the British JP-233, now being used to destroy Iraqi runways.[14]

These papers are intended to provide a working knowledge of our expensive weapons in Iraq, and the issues concerning their performance. Earlier this week, we released a paper on close air support. Attacked to this introduction is a short study of the Patriot missile. Later papers will discuss strategic bombing, tactical bombing, and specific weapons such as the Maverick missile.

The Project on Government Procurement staff is ready to answer your questions, provide you with access to our files, and recommend experts in fields discussed below. All sources are listed or available through the Project. All dollar figures are inflated to 1990 dollars using DoD-approved inflation indices. Please call us at (202) 543-0883.

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[13]. James Bernstein, "Tornados Rocked in Desert Storm", Newsday, Nassau & Suffolk Edition, 1/26/91, p.6

[14]. Richard Sia, "Air Force Pursues Bomb That May Have No Target", Baltimore Sun, 1/29/90, p.1A

PROJECT ON GOVERNMENT PROCUREMENT

Capabilities of Modern Main Battle Tanks

February 26, 1991

Memorandum to the Press

From the Project Staff

Since the commencement of operation Desert Shield, there has been much press attention given to the U.S. Army's M1 main battle tank. Much of this attention has been favorable, and has focused on the capabilities of the M1 tank, and the shortcomings of various Iraqi tanks. While much of this has been informative, we believe the following comparison of strengths-to-strengths, and weaknesses-to-weaknesses will shed some light on overall tank performance.

To begin with, the M1 series (including the M1 and M1A1 tanks) is often presented as embodying technical innovations which place it head and shoulders above any other tank in the world. The following is a summary of M1 series highlights:

* **Shoot-on-the-Move Accuracy:** Computers and gyroscopes keep the turret *stabilized* during movement, and automatically compensate for range and other factors, to ensure a hit. Laser range-finders are used to tell exactly how far away the target is. These technologies are used on nearly every tank in production today, as well as many obsolete tanks.

* **High Speed Maneuverability:** The M1 uses a 1,500 hp turbine engine to accelerate quickly, and move at high speed. Several tanks match the M1's speed and power to weight ratio with diesel engines, without sacrificing protection or firepower. See top speed and horsepower per ton on chart below.

* **Advanced Armor Protection:** The German's claim to have equalled the protection of the M1A1 (and M1A2), with their own advanced armor on the Leopard II (which is also faster and carries more ammunition than the M1A1). And many other countries operate tanks with modern composite armor, including Iraq.

* **Night Fighting Capability:** The M1 series uses passive infrared sights that allow the gunner and other crew members to see at night at great distances. These sights, as well as active infrared sights, are used by most tanks in the Gulf war. Active sights, such as those used on many Iraqi tanks, are less useful because they require the use of infrared searchlights. While these cannot be seen by the unaided eye, they show up brightly on passive infrared sights.

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There are many other capabilities that are important in tanks. A good example is reliability. Russian tanks are notorious for their lack of reliability. In many Arab Israeli wars, many Russian-made tanks were apparently abandoned due to breakdowns, without ever being hit. David Isby, an expert on Soviet equipment, points out that Russian T-62's, of which Iraq had 1,000[1], break down roughly every 113 miles.[2] This is not much worse than the M1A1's 152 mile average (usually expressed in Mean Miles Between Failures or MMBF), and is actually better than the M1's 110 MMBF reliability figure.[3]

These reliability figures for the M1 series do not take into account the extra time required to maintain air filters in the dusty Gulf environment. The procedure often shown on television, in which engine air filters are cleaned by tank crews, is referred to as an *emergency* procedure in the M1 operator's manual. It requires the tank to be shut down completely. The engine cannot run, and the main gun cannot be aimed during this process. If possible, tankers are told to return to organizational maintenance for this service. If the filters are not cleaned, the engine can be severely damaged, and may shut down, leaving the tank stranded. Nonetheless, since the procedure can be accomplished in less than 30 min, and does not *require* outside help, it is not recorded as a failure contributing to the Army's reliability figures.

On the other hand, the Russian-built T-72 tank has some advantages over other tanks. In particular, the T-72 has the capability to dig itself into a defensive position, 20 min or less, without outside help. It uses a bulldozer blade to create a depression, which, when occupied by the tank, exposes only the tank's turret. Thus, the T-72 can quickly move, and create new defensive positions in which it is difficult to hit. While the M1 may be capable of mounting a similar dozer blade, none have been deployed to the gulf, according to Major Ron Mazzia, of the U.S. Army Armor School. Iraq started the war with roughly 500 T-72's.[4]

The T-62 tank, making up a large part of the Iraqi tank force, is designed to defend itself against laser-guided weapons, such as the Hellfire missile carried by the Apache helicopter. The system, part of the tank's laser range-finder, allows the tank to detect laser targeting systems, and find their approximate location. It will be interesting to see whether or not the Iraqis have been capable of using this system effectively.

The following chart is offered as a means of quick comparison of tank capabilities. Please note that American tanks are the only ones listed that use more than a gallon of fuel per mile traveled.

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[1] **Captain James M. Warford, "The Tanks of Babylon: Main Battle Tanks of the Iraqi Army", Armor Magazine, November-December 1990, p.19.**

[2] David Isby, Weapons & Tactics of the Soviet Union, Jane's, 1981, p.77. Isby reports T-62 breakdowns every 160-240km.

[3] David Isby's figures are listed as average distance between "breakdowns". The M1 figures computed from the data in the Logistic Management Analysis Summaries for the M1 and M1A1 tanks, 1st half 1988. The M1 figures include only "combat mission failures" (breakdowns which cause a mission to be aborted), and do not include *any* failure that could be fixed using men, equipment and parts carried on the tank.

[4] Captain James M. Warford, Op Cit.

Tank Vital Statistics

Tank Model	Gun mm	Ammo Rounds	Night Vision	Laser Range	Turret Stabile	Dozer Blade	Max Speed	HP/ Ton	Gal / Mile	Range Mile	MMBF	Price $Million
American Main Battle Tanks In Desert Storm												
M1A1	120	40	Yes	Yes	Yes	No	43	23.8	1.77	286	152	4.4
M1	105	55	Yes	Yes	Yes	No	43	24.6	1.71	295	110	-
M60A1	105	63	Yes	No	Opt	Opt	30	13.7	1.23	313	175	1.1
Iraqi Main Battle Tanks in Desert Storm												
T-72	125	39	Yes[5]	Yes	Yes	Yes	50	17.3	.88	438	-	2.2
T-62	115	40	Yes	No	Yes	-	31	13.2	.88	406	113	1.2
T-55 (Mod)	125	40	Yes	No	Yes	-	31	14.6	.68	375	-	-
T-55 (Mod)	100	43	Yes	No	Yes	-	31	13.4	-	-	-	-
Type 69	100	34	Yes	Yes	Yes	-	31	14.3	-	269	-	-
Type 59	100	34	Some	Some	Some	-	28	13.1	.86	375	-	.5
Allied Tanks in Desert Storm												
Challenger	120	42	Yes	Yes	Yes	Opt	35	17.6	-	-	-	-
Chieftain	120	64	Yes	Yes	Yes	Opt	30	12.4	.89	281	-	-
AMX-30	105	47	Yes	Yes	Yes	-	38	18.2	.75	344	-	-
Significant Tanks Not in Desert Storm												
M60A3	105	63	Yes	Yes	Yes	Opt	30	13.0	1.26	298	-	-
Merkava Mk3	120	50	Yes	Yes	Yes	Opt	34	17.9	.76	313	-	2.4
Leopard II	120	42	Yes	Yes	Yes	-	45	24.7	.92	343	-	2.5

- Unknown

MMBF Mean Miles Between Failures. The average distance traveled between breakdowns.

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[5]. Some Iraqi T-72's may not have laser rangefinders.

Sources:

Foss, Christopher F., Jane's Armour and Artillery: 1990-91, Jane's Information Group, Surrey, UK

Isby, David, Weapons & Tactics of the Soviet Union, Jane's Information Group, Surrey, UK, 1981

Warford, Captain James M., "The Tanks of Babylon: Main Battle Tanks of the Iraqi Army", Armor Magazine, November-December, 1990, p.19

TM 9-2350-264-10, Operator's Manual: Tank, Combat, Full-Tracked, 120-MM Gun, M1A1 (2350-01-087-1095), General Abrams

Logistic Management Analysis Summary, for the M1, M1A1 and M60A3 tanks, U.S. Army Tank Automotive Command

Stockholm International Peace Research Institute, International Arms Trade Database, Stockholm, Sweden, 1991

Procurement Programs (P-1), Department of Defense Budget for Fiscal Year 1983 through 1991, Office of the Comptroller of the United States

Hearings Before the Senate Appropriations Committee, Defense Appropriations for Fiscal Year 1975, part 3

Hearings Before the Senate Appropriations Committee, Defense Appropriations for Fiscal Year 1969, part 3

Hearings Before the House Appropriations Committee, Defense Appropriations for Fiscal Year 1977, Army Budget Justification, Air Force Strategic Programs (CIS # 181-74)

Hearings Before the House Appropriations Committee, Defense Appropriations for Fiscal Year 1973, Air Force Procurement Programs (CIS # 181-57)

National Defense Budget Estimates for FY1990/1991, Office of the Assistant Secretary of Defense (Comptroller), March 1989

PROJECT ON GOVERNMENT PROCUREMENT

Briefing Paper for All Defense Reporters:

From: The Project on Government Procurement Staff

Date: 2/12/91

The following is one of several sections of High Tech Weapons Effectiveness In the Gulf: Hype or Reality?, a report soon to be released by the Project on Government Procurement. This and other sections will routinely be released, updated and revised during the course of Desert Storm. This series is not intended to criticize high tech weapons performance, particularly since specific information about many systems has not yet become available. The goal of this series is to prompt greater scrutiny and to add some perspective to blanket statements that high tech weapons have proven their worth in Desert Storm.

The Project on Government Procurement staff is ready to answer your questions, provide you with access to our files, and recommend experts in fields discussed below. All sources are listed or available through the Project. All dollar figures are inflated to 1990 dollars using DoD-approved inflation indices.

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Close Air Support - Air Power Helping Infantry

The purpose of close air support (CAS) is to directly affect the outcome of a battle by providing extra firepower from the air to engaged friendly troops on the ground. To do this, the aircraft must somehow be able to locate and identify enemy targets and avoid hitting friendly troops on the ground. Target identification is mainly accomplished by spotters in the air, on the ground or by the CAS pilot. Target identification is crucial to avoid deaths by friendly fire. The Pentagon recently confirmed that seven U.S. Marines were killed when an American A-10 aircraft mistakenly fired on their Light Armored Vehicle.[1] Sophisticated infrared devices and night vision goggles alone do not permit identification of friend or foe.

This dangerous job is performed both by the Air Force, and by the Army itself. While the Army is usually barred from operating armed airplanes, it can, and does, operate many helicopters. Between the Army and the Air Force, there are currently three aircraft dedicated to close air support: the A-10 Thunderbolt II, the F/A-16 Falcon and the AH-64 Apache helicopter. Of these, the least expensive, most heavily armed and armored is the A-10 Thunderbolt II jet aircraft. But while there are at least 100 A-10s in Saudi Arabia, the Air Force plans to retire it soon, filling its role with the F/A-16 attack plane and the Army's AH-64 Apache helicopter.

A-10 Thunderbolt II Close-Air-Support Aircraft

Price: Roughly $10.7 million Each

Number Deployed in Desert Storm: At Least 100

Mission: To provide fire support for troops on the ground, Including destroying tanks

Weapons: 30mm High-Velocity Cannon, Guided and Unguided Bombs, Maverick Antitank Missiles, Sidewinder Air-to-Air Missiles

First Deployed: 1976

Comments: The A-10 Thunderbolt is the only aircraft in the U.S. inventory designed from the outset to provide close air support. As such, the A-10 is well suited to the role, in addition to being 40 percent less expensive than its competitor, the F-16. The A-10 underwent rigorous survivability testing early in its development, and is, as a result, heavily armored. According to Air Force testers and early experience in the Gulf, the A-10 can safely return to base with one of its two engines out, or half of one wing shot off. Recently, an A-10 returned home safely after sustaining heavy wing damage from Iraqi fire. Senior Airman Jennifer Earnshaw, U.S.A.F. said, "Any other aircraft would not have made it back."[2]

The A-10 is also the only aircraft in the inventory designed to carry the GAU-8 high-velocity 30mm cannon. This weapon fires 35 to 70 bullets *per second*. Each of these consists of a very narrow dart made of depleted uranium. These projectiles are capable of penetrating and destroying even the most heavily armored main battle tanks. This cannon and its ammunition are excellent examples of simple, inexpensive technology which is highly effective.

The Air Force nonetheless is seeking to replace aging A-10s with a version of the F-16 modified by the addition of a cannon capable of firing the A-10's GAU-8 ammunition. Prior to the war, the Air Force planned to turn-over most of the A-10 fleet to the Army. But when the Gulf war erupted, Air Force officials may have changed their minds, and the A-10 is now being used for strategic bombing. As Airman Earnshaw commented, "I always got dogged-out by other people. They would say the A-10 is not even a jet ... it's just an ugly bird. Now everyone's opinion has changed."[3]

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[1] Rick Atkinson & Barton Gellman, "U.S. Confirms 'Friendly Fire' Killed 7 Marines", Washington Post, 2/4/91, p.A1

[2]. Molly Moore, "'Warthogs' Pursue and Elusive Prey", The Washington Post, 2/12/91, p.A1

F/A-16 Falcon Fighter/Bomber/Close Air Support Aircraft

Price: $18 million Each

Number Deployed in Desert Storm: One Squadron (20 - 30 Aircraft)

Mission: To destroy enemy fighters and bombers, to bomb targets behind enemy lines in all weather, and to provide fire support for friendly troops engaged in combat

Weapons: 20mm cannon, 30mm high-velocity cannon, Sidewinder, Sparrow and AMRAAM air-to-air missiles, and a wide variety of air-to-ground missiles and bombs, including the Maverick

First Deployed: 1979

Comments: The Air Force is exploring ways to allow the F-16 to provide close air support. As such, it will be referred to as the F/A-16 or A-16. The F-16 can already carry Maverick anti-tank missiles, as well as bombs, napalm and cluster bombs. Recently the Air Force has equipped a squadron of F-16s with a high-velocity 30mm cannon that fires the same ammunition as the A-10's GAU-8 cannon. This is carried in a pod mounted to the belly of the aircraft, taking the place of bombs, missiles or an external fuel tank.

While it seems clear that the F-16 is a fast, highly-maneuverable aircraft that can carry many effective close air support weapons, it is unclear whether it could survive in such a role. The F-16 is neither as well protected, nor as resilient as the A-10. The A-10 has two engines as compared to the F-16's one, and can return "home" safely with one engine knocked out. The A-10 also surrounds its pilot in a titanium armored "bathtub". The F-16 has no such protection for the pilot. An example of the F-16's delicate components is its computerized fly-by-wire flight control system which, if damaged in combat, will result in loss of control of the aircraft. By contrast, the A-10 has a more resilient mechanical flight control system *with an additional backup system.*

The Air Force maintains that F-16s can survive by virtue of their extra speed, and by shooting from long distances -- thus avoiding enemy ground fire.[4] However, the further the F-16 is from its target, the harder it is for the pilot to see, and accurately identify it. As a result, the pilot runs the risk of killing friendly troops. (A special report on the Maverick missile will talk about identification problems.)

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[3]. Ibid

[4]. David Hughes, "Syracuse Wing Finds F-16A Effective in Close Air Support", Aviation Week & Space Technology, 6/18/90, p.36 - 42

APACHE

Price: $11.72 million each

Mission: Close Air Support (CAS) of infantry. Apache is designed to destroy enemy tanks and vehicles, and to attack enemy ground troops and helicopters.

Weapons: Hellfire anti-tank missile, 30mm chain gun, 2.75 inch rockets; has been tested with Sidewinder and Stinger air-to-air missiles

Date First Deployed: July, 1986

Comments: The Apache has a crucial role in the support of ground troops. It carries Hellfire missiles to kill tanks, and other armament to attack enemy troops. Interestingly, although the Apache can carry more missiles, it has few other obvious advantages over Air Force A-10 aircraft, which is better armored, carries ten times as much weaponry over-all, and costs $1.5 million less per aircraft. However, the laser-guided Hellfire missile carried by the Apache carries a much smaller warhead than the A-10's Maverick. The Hellfire's laser guidance system also comes with its own set of problems. The Hellfire must either be targeted by the Apache gunner, or by a laser fired by a soldier on the ground. Targeting is accomplished by "designating" a target by shooting a laser beam at it. The GAO had the following to say about this procedure:

> "Numerous battlefield conditions may degrade the effectiveness of laser-guided weapons, such as availability of adequate numbers of designators, survivability of designators, communications required between the ground or airborne observers and the strike aircraft, and the ability to designate the targets with the required accuracy and stability."[5]

Laser can also be thwarted by smoke, dust, and other visual barriers. Most main battle tanks, and many armored personnel carriers carry a large array of smoke grenade launchers, capable of surrounding the vehicle in opaque smoke. These vehicles also can often create smoke by injecting water or oil into the engine, or simply by kicking up dust as they drive.

The Apache/Hellfire system does have some advantages over the Maverick. (We will soon be publishing a report on target identification problems with the Maverick.) While target identification at long range can be a problem with the Maverick and Hellfire missiles, this is mitigated somewhat by the Apache's full-time gunner, who, unlike an F-16 or A-10 pilot, who can concentrate on identification, rather than on flying the airplane. The gunner is provided with an elaborate Target Acquisition and Designation Sight (TADS) visual aid system to allow him to magnify battle scenes miles away. It is unclear, however, how well this will work at night, when the Apache gunner must use blurry infrared images, or in intense fighting, when the battlefield will be shrouded in dust and smoke.

Even if one assumes that the Apache is as effective as advertised, data collected by the Army under near ideal peacetime conditions show an average of only 50% of the Apaches available to perform missions with all their capabilities at any given time. Thirty-five percent of the time, the average Apache is not flyable and cannot perform any mission.[6] This low rate of availability conflicts with Army tactics which call for 83 percent (15 of 18) Apaches in a battalion to be available at any given time. While the Army has suggested that these reliability problems have been solved, sources in the Gulf dispute these claims.

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[5]. See previous note.

[6]. Apache Helicopter: Serious Logistical Support Problems Must Be Solved To Realize Combat Potential, GAO/NSIAD-90-294, September 1990

Reliability problems can directly impact the safety of troops on the ground. If a helicopter breaks down too often, it will not be available on the spur of the moment to help troops. For example, the GAO wrote:

> "The first mission of the [Panama] operation illustrated the impact of reliability problems: one of the two Apaches assigned to the mission aborted before takeoff because of a hydraulics problem, while the second Apache, after completing its assigned mission, had an opportunity to provide additional mission support but was unable to because of an electronics failure." (GAO/NSIAD-90-294)

The Apache suffers from a major system breakdown about every 2.5 hours of flight time on average, according to that GAO study.

The GAO further noted that actual combat conditions would be much harsher than the peacetime conditions in which the Apache demonstrated a 50 percent rate of availability. They cited the following factors as contributing to deceptively high availability rates in peacetime:[7]

* The Apache is only flown an average of 1/2 hour per day in peacetime. In combat it will be expected to fly 4 hours per day. These higher usage rates, together with battle damage, will significantly reduce Apache availability.

* In peacetime, the Apache is flown from paved airfields, whereas in wartime, it will more often fly from dirt or sand areas. Exposure to dirt and sand will make maintenance more difficult, and will degrade Apache availability.

* Apache units rely heavily on contractor support for routine maintenance. Being unable to maintain its own high-tech equipment puts civilians at risk in battle areas (such as Saudi Arabia). This phenomenon is not unique to the Apache.

* The Army's compilation of the 50 percent availability figure for peacetime operations did not include incidents where the helicopters were in depot level maintenance. By not including this time, the Army inflates readiness figures. GAO estimated that this would reduce the actual availability by two to five percentage points.

The GAO concluded:

> "Considering these results, along with known shortfalls in people and test equipment, it is questionable whether 15 of a battalion of 18 Apaches could be sustained as needed in high intensity combat."

The effect of these problems is that other anti-tank and close air support operations may have to assume responsibility for the Apache's part in protecting U.S. ground troops.

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[7]. Apache Helicopter: Serious Logistical Support Problems Must be Solved to Realize Combat Potential, GAO/NSIAD-90-294, September 1990

PROJECT ON GOVERNMENT PROCUREMENT

Briefings For Defense Reporters

From: The Project on Government Procurement Staff

Date: 2/15/91

This is part of a series of papers intended to prompt greater scrutiny of recent statements regarding the performance of weapons being used in Desert Storm. While early reports have declared the "high-tech" air war extraordinarily successful, there is not yet enough information to make a full judgement. Meanwhile, the allied bombing campaign does not seem to have achieved its objectives as quickly as planned. Prior to Desert Storm, an internal Air Force briefing for President Bush predicted that Iraq's overall combat effectiveness would be reduced by 50 percent within weeks of the allied bombing effort.[1] A Pentagon official recently said that, "'Nobody in his right mind' in the military hierarchy believes that allied forces have cut the fighting capability of Saddam Hussein's forces in half."[2]

These papers are not intended to criticize high-tech weapons performance, particularly since specific information about many systems has not yet become available. However, using the available information, this paper is intended to add some perspective to blanket statements that high-tech weapons have proven effective during the war. One such statement was recently offered by Defense Secretary Richard Cheney this week:

> **A decade of doom-and-gloom reporting made a lot of people forget that we do, in fact, lead the world in advanced technology. Now Americans are watching our Patriot missiles bust Scuds over Riyadh and Tel Aviv.**[3]

The following issues might be considered when evaluating reports on the Gulf war:

* To date the conflict is missing what military experts call "the fog of war" associated with a capable, aggressive enemy. Due to the Iraqis' limited air force capabilities, the allies have not had to cope with the mass confusion and chaos which occurs in most wars. So many high tech weapons, designed to fight in the more difficult circumstances created by resourceful enemies -- have not been tested in combat.

* An American aircraft mistakenly fired a Maverick missile at a U.S. vehicle, killing seven marines. Critics have long warned that the Maverick's design could cause incidents like this in heavy combat.[4] Meanwhile, a U.S. Cobra helicopter fired six TOW missiles before it destroyed one Iraqi armored personnel carrier.[5] The TOW is supposed to kill more heavily armored tanks with one shot.

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[1] Patrick E. Tyler, "Bush Doubts Air War Alone Will Defeat the Iraqi Military; Top Units Still Judged Able", The New York Times, 2/6/91, p.A1

[2] Ibid.

[3] Secretary of Defense Richard Cheney, in a speech before the U.S. Chamber of Commerce, 2/13/91, reported by Federal News Service.

[4] It should be noted that this incident occurred at night, when identification problems are at their worst. Nonetheless, Maverick missiles do not allow as much opportunity for accurate target identification as do other systems, such as anti-tank airborne cannons. We will soon publish a paper specifically on the Maverick Missile.

[5] Caryle Murphy & Molly Moore, "Attacks at Saudi Border Kill 12 U.S. Marines; Iraqis Lose 24 Tanks, Suffer 'Heavy' Casualties", Washington Post, 1/31/91, p.A1

613 Pennsylvania Avenue, S.E. 2nd Floor Washington, D.C. 20003 (202) 543-0883 FAX (202) 544-3729
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* The Patriot missile has achieved success against Scud missiles, which fall in predictable paths, and have been attacking in small numbers. The Patriot was designed for the much more difficult role of engaging multiple, maneuvering targets, where the enemy is constantly trying to attack the system in a variety of ways. The taxpayers paid substantial sums for these complicated capabilities. There has not yet been a chance to prove them.

* The U.S. has continuously bombed Iraq with aircraft and hundreds of Tomahawk cruise missiles -- with little interference from Hussein's air force. Yet, after nearly 70,000 sorties, nearly half of Iraq's aircraft shelters remain intact, and mobile Scuds continue to evade our attacks.[6] We may have dropped several times the amount of ordinance dropped in *all of World War II*[7], and yet Iraqi armored forces have only been reduced by roughly 30%.[8]

* According to an early briefing by General Schwarzkopf, over 790 sorties were required to attack 33 bridges. Apparently an average of 24 sorties were needed to attack *each bridge.* And there were three additional bridges targeted, but not attacked.[9] While this is not actually an exorbitant number, it contrasts with to the one-bomb-per-target image created by early strike footage released by the Pentagon.[10]

* General Tom Kelly has twice cited airplane shortages as a factor behind the military's inability to hit key targets such as Iraqi supply lines and mobile Scud missiles.[11] While military officials speak of crowded skies over Iraq and Kuwait, one should remember that *single raids* against Germany in World War II involved over one thousand aircraft each. We might have procured larger numbers of aircraft had they been cheaper. The U.S. Air Force overlooked high performance aircraft costing roughly $6 million each in procuring the complex $49 million F-15.

* Gen. Colin Powell, chairman of the Joint Chiefs, has stated that a key objective of the air campaign is to isolate and kill Hussein's forces. Perfect isolation/interdiction of enemy forces has occurred only three times in history, and in each of those cases, the U.S. suffered significant casualties. In these three World War II battles, the Japanese were *perfectly isolated* and heavily bombarded by battleships, which can lay down as much fire in an hour as 56 modern aircraft carriers, carrying a total of over 5,000 aircraft. While the Japanese troops, like the Iraqis, were heavily entrenched in defensive positions, the situations may not be comparable since this is a "high-tech war", and it is difficult to evaluate the resolve of Iraqi troops.

  Tarawa --- 3,300 U.S. casualties in three days
  Iwo Jima --- 26,000 U.S. casualties in three months
  Okinawa --- 49,000 U.S. casualties in three months[12]

* Aircraft losses may increase dramatically as we fly lower to engage moving tanks and other ground targets. Flying lower exposes our aircraft to Iraq's 8,000 anti-aircraft guns. The vast majority of our air losses in Vietnam were caused by guns. Heavy losses continue with British Tornado aircraft flying at low level. More Tornados have been lost than any other allied aircraft.[13]

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[6]. Gen. Tom Kelly, Defense Department Regular Briefing, Federal News Service, 2/13/91

[7]. DoD has not released figures on total ordinance delivered, or ordinance dropped per mission. The total of the explosives used in World War II is compared to the destructive force of the Hiroshima and Nagasaki atomic bombs, which were roughly equivalent to 15,000 tons of TNT each. 70,000 sorties would allow many times that amount of TNT to be dropped on Iraq.

[8]. Defense Department Regular Briefing, 2/14/91, Federal News Service.

[9]. Schwarzkopf press briefing, 30 January 1991

[10]. Also, bear in mind that some of these sorties are not bomb-carrying aircraft, but rather fighters providing air cover.

[11]. Defense Department Regular Briefing, Federal News Service, 1/28/91. The comment was repeated in the 2/13/91 briefing.

[12]. Figures taken from West Point history of WWII, and World War Two, by Liddell Hart.

[13]. James Bernstein, "Tornados Rocked in Desert Storm", Newsday, Nassau & Suffolk Edition, 1/26/91, p.6

- The 30-year-old B-52 strategic bomber is being used in Desert Storm. It's successor, the B-1B bomber, has not been deployed to the Gulf, and it is still suffering from lingering technical problems. After $30 billion spent, and four years since the last B-1B rolled off the assembly line, this aircraft is grounded and incapable of performing conventional missions now called for in the Middle East.

- Despite hundreds of millions spent and ten years of effort, the U.S. Air Force has no weapon comparable to the British JP-233, now being used to destroy Iraqi runways.[14]

These papers are intended to provide a working knowledge of our expensive weapons in Iraq, and the issues concerning their performance. Earlier this week, we released a paper on close air support. Attacked to this introduction is a short study of the Patriot missile. Later papers will discuss strategic bombing, tactical bombing, and specific weapons such as the Maverick missile.

The Project on Government Procurement staff is ready to answer your questions, provide you with access to our files, and recommend experts in fields discussed below. All sources are listed or available through the Project. All dollar figures are inflated to 1990 dollars using DoD-approved inflation indices. Please call us at (202) 543-0883.

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[14]. Richard Sia, "Air Force Pursues Bomb That May Have No Target", Baltimore Sun, 1/29/90, p.1A

The Patriot and the Scud

Price: **$1.1 million per missile**

Mission: **Patriot was designed to provide air defense against multiple, maneuvering aircraft attacking in a heavy electronic countermeasures environment. It was later modified to include point defense against some ballistic missiles. The Patriot was also designed to be deployable on or near the front lines, and to move with advancing troops.**

Date First Deployed: circa 1985

Comments: The Patriot's success against Scud attacks has been widely heralded as a victory for high-tech weaponry, a justification for SDI and a clear validation of the Patriot program itself. As President Bush told Raytheon workers in a speech today:

> **For years we've heard that anti-missile defenses won't work. The shooting down of a ballistic missile is impossible - like trying to hit a bullet with a bullet. Some people called it impossible, you called it your job. And they were wrong, and you were right. Thank God you were right!**

The Patriot, while successful so far in shooting down Iraqi Scuds, has been operating under *favorable combat conditions,* far removed from the confusion of war for which it was designed at great cost. So far, it has demonstrated only part of its required mission capabilities in the Gulf.

As originally procured, the Patriot was intended to proved mobile defense against aircraft for rear areas of combat units, as they advanced across Europe. As deployed in Israel and Saudi Arabia, the Patriot has endeavored to defend stationary civilian and military targets from Scud ballistic missiles, a role often cited as a justification for SDI.

As ballistic missiles go, however, Scuds are easy targets. They have large radar cross sections which make them far easier to track. Scuds are relatively slow targets compared to the more modern Soviet intermediate range missiles the Patriot was also upgraded to intercept -- and much slower than intercontinental ballistic missiles (ICMBs). Furthermore, Scuds fall in predictable (parabolic) paths and have no decoys or multiple warheads like many modern missiles.

The Patriot also protects only a limited area, a concept known as point defense. Two Scud missiles recently landed in the Saudi town of Hafir Al-Batin. Patriots were unable to engage them, because they "weren't in a Patriot fan."[15] The Patriot's coverage appears to be small enough that nuclear warheads would be able to fall outside Patriot's coverage and still cause significant damage to non-hardened targets, like cities -- or the Patriot itself. Thus, before Patriot is used as a major argument for the Star Wars anti-nuclear missile defense, it is important to understand the limited threat posed by the Scud relative to other missiles -- and further realize that even the Patriots' reasonably good record against conventional Scuds could still be inadequate against nuclear tipped missiles. Patriot missiles are also, as of this time, limited in their ability to destroy chemical warheads mounted on ballistic missiles.[16]

There has never been a 100 percent effective shield. The Patriots' success in the civil defense role has been no exception. Of 64 Scud missiles fired, 42 have been engaged by Patriot, and 41 shot down.[17] Not only has the Patriot missed Scud missiles on several occasions, most notably in Israel, but it has also allowed dangerous debris, including warheads, to rain down on heavily-populated areas. Twenty-nine people were injured by debris in a suburb of Riyadh after an interception considered successful by the press.[18] Witnesses have described Scuds exploding on the ground after being hit with Patriots.[19]

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[15]. General Tom Kelly, Defense Department Regular Briefing, Federal News Service, 2/14/91

[16]. Sarah Christy and Tony Capaccio, "Patriot Missile: Army Cinderella Story", Defense Week, 1/23/91, p.1

[17]. 64 Scuds launched: General Tom Kelly, Defense Department Regular Briefing, Federal News Service, 2/14/91. 42 engaged, 41 hit, President George Bush, Reytheon Speech, 2/15/91

This level of success would probably be acceptable in the defense of hardened or dispersed military targets. Unlike fragile civilian homes, military installations and equipment are usually protected by steel-reinforced concrete. It is well understood that the Scud has never posed a particular threat to these types of targets due to its inaccuracy.

More important that the theoretical implications the Patriot might have for SDI are the capabilities we, as taxpayers, paid for in the Patriot system. The following points compare and contrast the conditions under which the Patriot was designed to perform, and the conditions it is experiencing now in the Gulf.

1) A capable, aggressive enemy creates confusion and real danger to the Patriot system. There has been no threat of attack by Iraqi anti-radar missiles because the Iraqi air force was outnumbered, outclassed, and quickly rendered ineffective. Credible threats by anti-radar missiles could cause the Patriot to shut down its radar. If the Iraqi air force had been more effective, Patriots' radar would probably have been turned off more often, increasing the chances for Scuds and airplanes to get through to their targets. This one-sided air victory would not have been possible in a European war with the Soviets, for which the Patriot was originally procured. The success of U.S. offensive air power has received the need for the defensive Patriot systems to function as designed.

2) Since the system has to handle only one threat, the system's capabilities to handle multiple threats is not heavily taxed. Crews have been able to focus primarily on a single threat, the Scud missile fired from a known direction and flying in predictable parabolic trajectories.

3) Patriot crews have had months to set up, calibrate and adjust their equipment for a rear defense of fixed points. They have not had to pack and frequently move.

By way of contrast, the Patriot was designed -- at great expense -- to be highly mobile (radar and software) in order to move with troops at the front lines and defend against enemy airplanes and missiles. This mission is much more difficult for a number of reasons:

1) Constantly moving complex equipment like the Patriot tends to cause more frequent breakdowns. The Patriot's designed mobility may have contributed a great deal to its overall cost, but has not been tested in combat. So far, no Patriots have been required to perform shortly after movement.

2) Enemy airplanes, unlike Scuds, will attempt to electronically jam the Patriot radar and communications and attack it with anti-radar missiles. The Patriot is designed with this in mind, but it has not proven its capability to overcome these problems in combat. However, since the Iraqis probably do not have this capability, a cheaper missile might have been sufficient to deal with the Iraqi air force.

3) Enemy airplanes, unlike Scuds, are maneuverable. Maneuvering targets are more difficult to hit. Also, airplanes can fly in low, attempting to hide from the Patriot's radar.

4) Before firing on an airplane, the Patriot must determine if it is friendly or hostile. Electronic devises called IFF (Identify Friend or Foe) are supposed to quickly enable the Patriot to hit only hostile targets. However, IFF devices have had many problems in the

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[18] Eric Schmitt, "U.S. Bombers Hit The Iraqi Bunkers And Supply Lines", New York Times, 2/4/91, p.A8.

[19]. Anton LaGuardia, "Scud Raid on Israel Foiled", Daily Telegraph, 1/24/91, p.1

past. Failure of IFF systems could make effective use of the Patriot much more difficult. (It was, in part, a failure of an IFF system which led to the destruction of an Iranian commercial airliner in the Persian Gulf by our most sophisticated radar ship, the Aegis cruiser.)[20] IFF is not required for incoming Scuds because any incoming missile is obviously hostile.

In summary, the Patriot has achieved some victories in Desert Storm, but it is far from having demonstrated its full range of capabilities. Its mobility and effectiveness against maneuvering aircraft is completely untested in combat. And its ability to protect soft, fixed targets against medium-ranged ballistic missiles, while reasonably good, is far from perfect. Whether or not this performance is worth the missile's $1.1 million per unit cost, and costly twenty-year development, is open to discussion.

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[20]. "Probe Focuses on Iranian F-14 IFF Signal Detected by Cruiser", Aviation Week & Space Technology, July 11, 1988, p.21

PROJECT ON GOVERNMENT PROCUREMENT

Briefing Paper for All Defense Reporters:

From: The Project on Government Procurement Staff

Date: 2/21/91

The following is one of several sections of High Tech Weapons Effectiveness In the Gulf: Hype or Reality?, a report soon to be released by the Project on Government Procurement. This and other sections will routinely be released, updated and revised during the course of Desert Storm. This series is not intended to criticize high tech weapons performance, particularly since specific information about many systems has not yet become available. The goal of this series is to prompt greater scrutiny and to add some perspective to blanket statements that high tech weapons have proven their worth in Desert Storm.

The Project on Government Procurement staff is ready to answer your questions, provide you with access to our files, and recommend experts in fields discussed below. All sources are listed or available through the Project. All dollar figures are inflated to 1990 dollars using DoD-approved inflation indices.

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5% of the Iranians gassed by the Iraqis died; the figure might have been even lower if all the Iranians had been beardless, thus allowing for a tight fit of their gas masks.

While the Iranians were ill prepared for a chemical attack, the allied forces are ready. Automated alarm systems deployed along the front will warn of chemical emissions. Any allied advance into Kuwait or Iraq will be accompanied by German-made vehicles called Fuchs. These bizarre-looking rovers, which have chemical probes sprouting from their armor, will move ahead of the troops, sniffing for trouble.

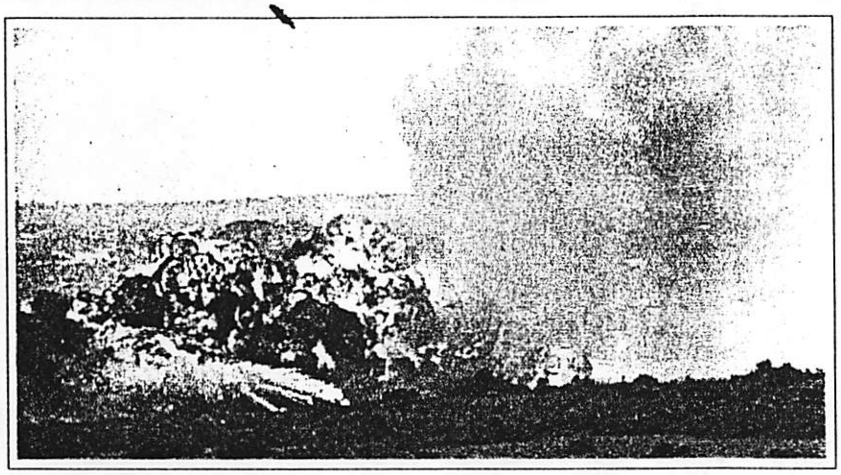
By now, U.S. soldiers, who carry their chemical gear at all times, are well rehearsed in donning their protective suits quickly. Some soldiers can get their masks on in four seconds. If a soldier gets gassed before he suits up or suffers ill effects despite the garment, which does not offer 100% protection, he can inject himself with antidotes. Combined with prophylactic pills given to troops facing a chemical danger, these can cut the lethality of an exposure by four-fifths.

Saddam's primary objective in a chemical strike would probably be to break up, disorganize and delay charging forces. Troops cannot move fast in those awkward suits without getting overheated. Soldiers would have to pause frequently to sip water, kept in sealed containers, through straws attached to their masks. Communications are also complicated. The masks have a microphone attachment, but the sound is poor. And because it is difficult to tell one suited soldier from another, commanders are not easily recognized.

Nevertheless, allied forces are prepared to "fight dirty" if necessary, that is, to continue an attack even if gassed. This poses logistical problems. Once a vehicle is contaminated, it must be kept away from clean ones, lest it pollute them too. With each round trip, resupply trucks that move from the front and back would have to be thoroughly cleansed, which can take up to 2½ hours. The same goes for vehicles transporting casualties. Gas victims must be isolated from other patients and given a thorough bathing in a hydrochloric-acid solution before being tended to by medical personnel.

Biological weapons are a far greater threat than chemical agents. Iraq is thought to have a limited capability to attack with biological agents, which pound for pound are deadlier than any other weapon, except for nuclear bombs. U.S. officials maintain that the masks handed out to the troops will also filter out most airborne germs. Yet there is no easy way to know immediately when such elements are present. All front-line combat troops have been inoculated against anthrax, which is considered Iraq's most likely germ choice, but not against many other potential diseases like tularemia and plague.

To some extent, Saddam doesn't actually have to use these deadly arms to achieve a large part of their power, which is to terrorize his opponents. "Chemical weapons are mind altering," says a Western official in Dhahran, "and they alter the mind before they're used." Just threatening to introduce them frightens troops, and that may subtly erode morale. —***Reported by Frank Melville/London, Dick Thompson/Dhahran and Bruce van Voorst/ Washington***



AP

A napalm strike during the Vietnam War: among the allies' most powerful weapons

How the Allies Might Retaliate

Although the U.S. has reserved the right to respond to chemical strikes in kind, it is unlikely to do so in the gulf war. Chemicals would achieve no military advantage that cannot be attained through conventional means, and their use by the allies would compromise long-term U.S. efforts to eliminate them from the planet. The U.S. has no chemical arms in its gulf arsenal, nor does it possess any biological weapons, having unilaterally forsworn them in 1969. Should Saddam Hussein fight dirty, however, the U.S. and its allies can retaliate by using other potent weapons against Iraqi troops. Among them:

FUEL-AIR EXPLOSIVES. The deadliest non-nuclear bombs in the allied arsenal, they disperse a highly volatile mist over a large area. When this cloud is ignited in a second explosion, the resulting blast packs nearly the wallop (but, of course, not the radiation) of a small nuclear device. The bombs also suck up oxygen, pulling the lungs and other organs of stricken troops partially out of their bodies. The mist from some fuel-air bombs can penetrate bunkers before detonating. Another advantage is that while the force of a conventional explosion decreases rapidly as one moves away from the center of the blast, the concussion of a fuel-air device is evenly distributed. The U.S. used fuel-air explosives to destroy mines in Kuwait last week and may use them against Saddam's troops to avenge a chemical strike. Some intelligence sources suspect Iraq has fuel-air bombs as well; the technology is not difficult to replicate.

NAPALM. Bombs containing this gooey gel, made from fatty acids mixed with gasoline, produce a hellish inferno when ignited, burning up everything in the target area or splattering it with the searing, sticky jelly. The naked, screaming girl in Nick Ut's famous photo from the Vietnam War was a napalm victim. British officials say that in light of its infamous reputation the allies do not intend to use it against Saddam's troops. But napalm, which is most effective against massed troops out in the open, is among allied weapons stockpiled in the gulf, and U.S. officials do not rule out its use.

GATOR BOMBS. A version of cluster bombs, they explode in midair, scattering small, hard-to-detect mines over a region as large as 90,000 sq. yds. Under normal conditions, a soldier might be able to sidestep these explosives, but in the heat of battle, there is a tendency to leap without looking. The gator bomb thus can create panic among the enemy.

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John J. Healey, of Ebasco, an architect-engineering concern, said that the Kuwaiti export installations were among the largest and most modern in the world. "Everything's big and everything's expensive," he said.

For the near term, Kuwaiti oil exports are not essential to the world market, with production from other countries having more than made up for oil from Kuwait and Iraq.

Kuwait's prewar capacity was estimated by specialists at 2.4 million barrels a day; its quota from the Organization of Petroleum Exporting Countries was 1.5 million barrels a day.

Kuwait was also a major exporter of refined oil products, and its refineries were among the most advanced in the world. Rebuilding them will also take years, experts think.

quickly pulled back. So did a pointed statement from Gen. H. Norman Schwarzkopf, the American commander, who said tonight that "U.S. forces are fully prepared for the execution of any action ordered by the President of the United States."

Saudi troops penetrated more than six miles into Kuwaiti territory to open a lane through an Iraqi minefield, a Saudi spokesman reported, and they lifted about 75 mines without encountering any enemy opposition.

By late tonight, American pilots and listening posts had detected "not a shred of evidence" that the Iraqis were preparing to leave Kuwait, an officer at General Schwarzkopf's headquarters in Riyadh said. He said there was "no radio traffic, no movement of tanks, trucks, nothing."

daily briefing in Washington showing fires in the big Rumaila and Bahra fields in northern Kuwait, as well as others south of Kuwait City.

General Neal said American soldiers had been trained to fight in the murky environment of oilfield fires, but Admiral McConnell said the smoke would make it harder for allied pilots to identify their targets.

Some of the fires were visible 40 miles away in Saudi Arabia, their orange flames boldly outlined against the horizon. At Khafji, the border town where the war's biggest battle so far was fought three weeks ago, the sky was almost dark at midday.

Baghdad's behavior puzzled American officials. General Neal said he was "as confused as you are" when asked by reporters to explain the contradictions between Mr. Hussein's bellicose speech on Thursday night and the subsequent peace negotiations in Moscow.

Scud Launched at Bahrain

While those negotiations were under way, the wells were torched and a Scud missile was launched toward the island nation of Bahrain in the Persian Gulf about 25 miles from Dhahran.

No one was hurt and no property damage was caused by that missile or three others fired only a few hours earlier at other Saudi cities. The first three, said Lieut. Gen. Thomas Kelly, the Pentagon chief of operations, were all fired from launchers positioned within Baghdad, which is a new operating procedure.

"The troops are in a difficult position, psychologically," a Medical Corps officer just back from an evacuation hospital in the north said. "They have to prepare for war and prepare to let go, too."

But most soldiers said they were deeply suspicious of Mr. Hussein's motives and thought that the only way to deal with him was to attack. "Tell the boss we ought to go ahead and bash this guy," said a military policeman at a roadblock here.

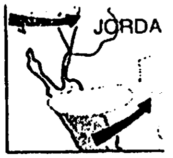
Airman 1st Class Mike Gray, waiting for a plane at the big air base, said of the Iraqi leader, "I can't see him keeping his word, not someone who talks about peace and fires Scuds."

Iraq Says Battle Has Begun

In a reflection, perhaps, of strained nerves, the Baghdad radio reported this morning that "the enemy has started the ground battle." The American command quickly denied it, and a Pentagon official remarked tartly, "If the Iraqis are leaping to the conclusion that the ground battle has begun on the basis of a single division shooting artillery fire, then they really don't comprehend the strength of the firepower of the coalition."

The air, artillery and naval barrage that opens the war, General Neal said, will make what has gone before look like "the tip of the iceberg."

A feature of the withering artillery volleys of the last few days has been fire from the Army's self-propelled multiple-launch rocket system, used here in combat for the first time. It can blast off its rockets, then speed away before enemy artillery can zero in — "shoot and scoot," the troops of the First Cavalry Division call the tactic, according to a pool report.



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NYT 2/23/91

Weapons

Napalm's Formula Is Simple, But Its Properties Are Lethal

By MALCOLM W. BROWNE

Napalm, which allied aircraft have reportedly begun dropping on Iraqi fortifications and tank obstacles in Kuwait, is one of the simplest but most effective weapons against enemy troops sheltered in caves, bunkers and other enclosed places.

Invented at Harvard University in cooperation with the United States Army during World War II, napalm is essentially jellied gasoline, thickened with an aluminum-based soap and other ingredients. Among these thickeners are naphthenic and palmitic acids, from which the word napalm is derived.

The substance, renamed "Incendergel" by the military in the Vietnam War, is used to fill bomb casings or as the fuel in flamethrowers. Napalm burns with intense heat, and it sticks to anything it touches, sometimes causing terrible casualties.

One of its chief values to field commanders is its ability to deplete the air of oxygen. A wave of napalm-fueled fire splashed across the mouths of a system of caves or trenchworks may fail to burn the occupants but can remove so much oxygen from the air that the defenders suffocate. For this reason, some opponents of its use have argued that napalm should be classified as a chemical weapon and banned.

Nevertheless, napalm remains a mainstay of armies and air forces throughout the world, and has been used in many wars and minor conflicts since it was introduced in World War II.

Gasoline and thickeners can be mixed just before use to make napalm bombs. Canisters resembling external fuel tanks are filled with the gel and ignited at the instant of impact by a fuse and booster similar to those used in explosive bombs.

According to news reports from Saudi Arabia, allied aircraft are dropping napalm canisters on ditches excavated by Iraqi forces in Kuwait as tank obstacles. It is expected that Iraqi forces will partly fill these ditches with oil and set them alight in the event of an allied land assault. Dropping napalm appears to be an effort to burn off the oil before an attack.

The napalm attacks may also be intended to inflict casualties on front-line Iraqi troops and to depress their morale.

Noncombat Bill: Up to $40 Billion

Special to The New York Times

WASHINGTON, Feb. 22 — Richard G. Darman, the budget director, said today that the Administration could not calculate the actual combat costs of the war with Iraq, but he provided the most detailed figures to date on other costs of the war.

At a news conference, Mr. Darman estimated that the costs not counting combat would be almost $40 billion between Oct. 1, 1990, and March 31, 1991, and said the figures would not change much even if the war ends before that. The cost of combat, he said, had been running between $150 million and $1.65 billion a day depending on the military operations.

The allies have pledged to contribute $53.5 billion through the end of March, and Mr. Darman said that might cover most if not all of the expense. But he asked Congress today to appropriate $15 billion in "working capital" so that bills could be met before the allied contributions are received.

Iraqi Hospitals

Only Urgent Cases Treated, Doctors Say

By Lee Hockstader
Washington Post Foreign Service

AMMAN, Jordan, March 15—Hospitals in Baghdad and the provincial Iraqi town of Al Fallujah, crippled by power shortages in the wake of the allied bomb campaign, are functioning at just 5 to 10 percent of capacity and are turning away patients, the medical group Doctors Without Borders said today.

Two doctors from the group, who arrived here following a six-day visit to Iraq, reported that hospitals they toured are treating emergency cases only and are desperately short of drugs and other supplies despite an international relief effort.

Some vaccines, for example, have gone bad because they cannot be refrigerated, they said. X-rays are not taken because there is a lack of chemicals to develop the film. Diagnosis has become difficult because medical labs are inoperable.

"Lack of energy is paralyzing the whole health care system," said Reginald Moreels, a Belgian physician.

"It's clear that people are dying, because services are functioning at a minimal level," said Dutch doctor Jacques de Milliano. "I'm sure that if conditions don't improve in the coming weeks, then we'll see a severe increase in death rates."

The two doctors spoke at a news conference given by Doctors Without Borders, a European-based, nonpartisan group specializing in emergency medical aid.

The two said they visited six of Baghdad's 24 hospitals. In Al Fallujah, a town about 35 miles west of Baghdad, they visited the only hospital as well as five health centers.

The doctors reported a "spectacular increase" in diarrhea cases, probably linked to contamination of water systems. They saw several cases of hepatitis, and a number of malnourished children.

However, despite warnings from Red Cross and other international aid officials that Iraq may face epidemics of typhoid and cholera, the doctors did not see any patients with those diseases.

They said that while the vast majority of hospital beds were empty because of the lack of electricity

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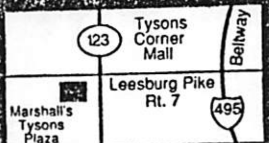

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CENTCOM Briefing
General Norman Schwarzkopf, USA
Riyadh, Saudi Arabia
Sunday, January 27, 1991 - 12:10 p.m. (EST)

General Schwarzkopf: Good evening, ladies and gentlemen. I'd like to start by giving you a brief operational update before I get into the more formal part of the briefing.

Today, as you all know, after nine days, we've flown over 23,000 sorties and air operations. In those air operations, we have over 26 air-to-air kills by the coalition air forces. The most recent engagement was 11:20 today, local time. Two U.S. F-15's engaged four Iraqi MIG-23's just southeast of Baghdad. At the conclusion of that engagement, there were four Iraqi MIG-23's destroyed -- there were no U.S. losses. The coalition also continues to attack his air force in the air, whenever we have an opportunity to do that, and we also attack them in their hardened shelters.

As you probably know, our air campaign has started to force his air force into Iran. Just since yesterday, we have over 39 aircraft that have gone into Iran -- to be precise, in the last 24 hours, since 1900 hours last night to 1900 hours tonight, we have had 23 aircraft go into Iran. Most of them have been fighter aircraft. We also continue to isolate his forces in the Kuwaiti theater of operation. We're continuing to successfully attack many of the key bridges going into that area. We have had no aircraft losses in the last 48 hours.

As far as naval operations are concerned, coalition forces have been actively attacking enemy patrol and mine-laying craft in the North Arabian Gulf, and near Bubiyan Island. As of today, 18 enemy vessels have been sunk or badly damaged.

Ground operations continue to be limited to sporadic artillery and rocket launcher fire by the Iraqis. The U.S. and coalition forces are countering that by employing close air support and artillery counter-battery fire.

As far as air defense activities are concerned, I'm sure you know that to date the Iraqis have fired 51 SCUD missiles -- 26 at Saudi Arabia and 25 at Israel. The most recent attack was last night at about 10:48 local time. I don't think I need to tell anybody here that we took one SCUD missile in Saudi Arabia from southern Iraq, and five SCUD missiles were launched against Israel from western Iraq. The Patriot battery at Riyadh, of course, did kill the incoming SCUD missile here; and preliminary reports indicate the Patriot missiles also killed all five incoming in Israel yesterday.

I think that concludes just a brief operational update, and I'd now like to talk to you a little bit about the military aspects of this oil spill. The reason why I chose to brief you today is because I heard a lot of questions yesterday from this group here and also the group in the Pentagon briefing, and we had to leave those questions unanswered because we were contemplating some action but we didn't want to endanger the air crews that were involved. Those actions have taken place, and so I'd like to now talk to you about it.

Oil as target - Schwarzkopf

On the evening of the 25th, after we had gotten the recommendations from these experts, we just happened to have a circumstantial happening out here at the sea island terminal. The United States Navy encountered a small boat. This was a small boat of a type that is suspected of supporting mine-laying craft; also a small boat that has anti-aircraft on it; and it's the type of small boat they've been going after out in the area because those boats have been shooting at them. They engaged that boat. That boat happened to be next to the sea island terminal, and as a result of that engagement, the sea island terminal caught fire. So just by circumstance, we did accomplish the first thing we were asked to do, and that is set the source on fire -- even though that's not exactly the way we expected to do it. I would tell you that the almost immediate results we saw though, on the night of the 25th, again, looking at hard evidence, is we found that the flow of oil out to the oil buoy had been cut off. As a result of this fire, it seemed like the flow of oil from the sea island terminal was considerably less than the flow of oil that was coming out of the oiling buoy.

This is a blow-up of the crude oil storage terminal north, and the crude oil storage terminal south. Basically what we have here is storage tanks, and south of these storage tanks are two small manifold areas -- a manifold area here, and a manifold area here. These two areas, by the way, are about three and a half miles apart, and they're approximately five miles away from the shore line. The sea island terminal is about eight miles further out.

What the petroleum engineers and the oil field experts advised us to do was to take out these manifolds. They said if we could destroy the manifold here, number one, it was the type of damage that could be repaired very quickly once we went back into the area in approximately two weeks' time, was their estimate; but they said if you take out these manifolds, the manifolds essentially control the flow of all the oil that comes out of the oil fields into the storage area, and further from the storage area out to the ocean, and the same thing with regard to coming through here. So that's what we decided to do.

Unfortunately, at that time the weather was very bad, and this obviously had to be a very precise military operation, because, as I say, we don't want to liberate Kuwait by destroying Kuwait. So we had to wait until a time when we could go ahead and launch that against those two manifolds -- 2230 last night was when we launched that exercise. I'd now like to show you a tape of that operation, and what you're going to see here, I'll be happy to explain.

The type of munition that was used was a GBU-15 guided precision munition fired from an F-111 aircraft. What you're going to be doing is looking directly through the TV camera in the nose of that aircraft as it goes right into the manifold, and you'll see the manifold area.

Q: General, what is a manifold?
A: A manifold is a system of pipes that controls the out-flow pressure out of the oil fields. That's as far as my expertise goes.

(Tape shown)

What you see here is the manifold area. That's the area that I talked about, and you're looking right through the nose of the guided munition as it's flown straight into the small manifold area to destroy it. That's one. This is the manifold area that was destroyed before.

This is the second one.

The Killing Deserts

Ellen Ray

In less than 48 hours, along several highways leading from Kuwait to Basra, U.S. pilots killed tens of thousands of retreating Iraqi soldiers, members of the Republican Guard, some with Kuwaiti hostages, and refugees fleeing the advancing allied sweep. The 38-kilometer stretch of the main road between Kuwait City and Basra, quickly dubbed "the road to Hell," had bumper to bumper traffic of both civilian and military vehicles -- each of which was mercilessly bombed from the air. From footage shown on ABC March 11, there was no indication of any survivors, as bodies and limbs littered the road and hung from the wrecks of trucks and cars more than ten days later.

"It was like shooting fish in a barrel," one pilot said. The retreating Iraqis were "basically just sitting ducks.... It was just a question of getting back and forth to the carrier to get more bombs...," said another. "Their preferred weapon -- the Rockeye cluster bomb was passed over for others because elevators were too slow getting them up to the flight deck in time for the next launch" (*Washington Post*, February 27, 1991, p. 1).

The British papers -- particularly the *Independent* (February 28) -- denounced the glee with which the American officers carried out the barrage, saying it "turned the stomachs" and was "sickening to witness a routed army being shot in the back." But the U.S. press almost universally applauded them as the heroes of what Jim Ridgeway called "the first of the Third World wars" (*Village Voice*, March 19, p. 19).

In the "softening up" that went on for 39 days before, air strikes against Iraqi conscripts were also unparalleled in their viciousness. The U.S. used hitherto unknown, gruesome antipersonnel weapons with names like Adam, Beehive, and Bouncing Betty, and "near-nuclear" explosives such as the fuel air bomb (see LOOT, March 1991, p. 5, and sidebar), as well as laser-guided Hellfire missiles and the old standbys, napalm and white phosphorous. With these, the heroes killed and maimed more than 200,000 half-starved, often barefoot, Iraqis.

John Balzar of the *Los Angeles Times*, in a description of the slaughter unlike anything in the antiseptic, celebratory *New York Times* coverage, told of watching videotapes of night vision gunsights in a briefing room ("Apache Copters: Deadly Havoc in the Dark of Night," February 24, p. A1):

> They looked like ghostly sheep flushed from a pen -- Iraqi infantrymen bewildered and terrified, jarred from sleep and fleeing their bunkers under a hellish fire. One by one, they were cut down by attackers they could not see or understand. Some were blown to bits by bursts of 30-millimeter exploding cannon shells. One man dropped, writhed on the ground, then struggled to his feet; another burst of fire tore him apart.

He described the tension in the briefing room: "Even hardened soldiers hold their breath as the Iraqi soldiers, as big as football players on the television screen, run with nowhere to hide. These are not bridges exploding or airplane hangars. These are men." But John Kifner, talking about the same unlevel playing field, wrote in the *Times* (February 25, p. A1):

> "It's an awesome sight," said Colonel Hill, surveying the helicopters under a darkening sky. "When I looked at it I thought, 'cry havoc and let loose the dogs of war.'" ... "We own this piece of desert," Lt. Phil Johnson, a Ranger, said with a grin as his Huey helicopter settled into the landing zone in a cloud of dust.

And if the superiority of U.S. weapons was acknowledged at all, it was never placed in the context of a human enemy (R.W. Apple, Jr., "Tanks and Troops Move Forward After Intense Artillery Barrage," February 24, p. A1):

> American pilots and their comrades from nine other nations flew bombing missions over Kuwait at a record pace for the second straight day, with 1200 strikes directed at Iraqi troop positions. In an effort to make way for armor and infantry men, they used napalm, ground clearing fuel-air bombs and cluster bombs, which the GIs describe as "steel rain."

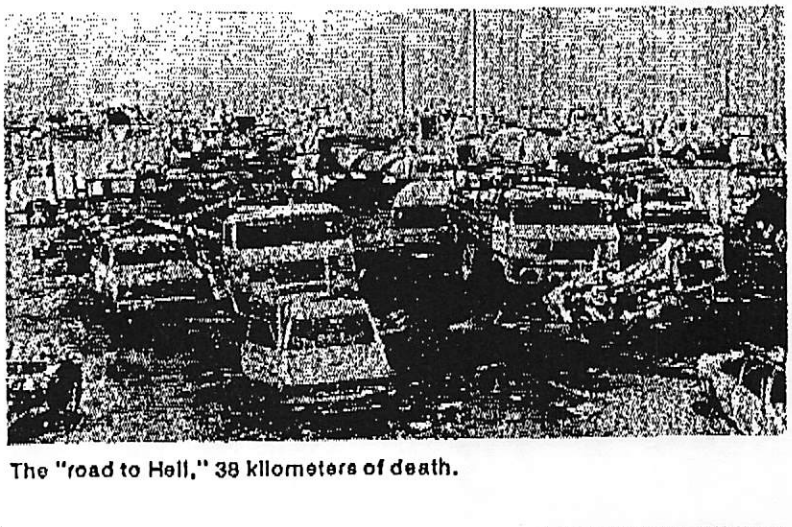
The Numbers Game

In another insult to its readers, the *New York Times* parroted Gen. Schwarzkopf's strained and self-serving mathematics: "Outnumbered and Outgunned, Allied Forces Outfox Hussein" (Michael R. Gordon, February 28, p. A9). This piece purported to demonstrate that the reason for the allied victory over Iraq was brilliant military strategy in the face of greater enemy troop strength and hardware, rather than the reality of brute force and the widespread carpet bombing of an entire country.

Gordon was referring to Schwarzkopf's news conference, in which he said:

> Basically, the problem we were faced with was this: When you looked at the troop numbers, they really outnumbered us about 3 to 2. And when you consider the number of combat service support people we had ... we were really outnumbered 2 to 1. In addition ... they had a great deal more artillery than we do.

Wide World Photos



The "road to Hell," 38 kilometers of death.

Introduction

How was this possible? Only four days earlier, the *Times* had reported (February 24, p. 1):

> In the immense Saudi desert, more than 700,000 allied troops—Americans, Britons, Frenchmen, Saudis, Egyptians, and smaller contingents from dozens of other nations—waited for an assault ... intended to push more than 500,000 Iraqi defenders out of their bunkers in Kuwait.

Just 400,000 allies would be used in the initial assault, but there were "over 533,000 American servicemen and women in the Persian Gulf region, according to a Pentagon tally, very close to the maximum number of American military people to serve in Vietnam."

It was astonishing that Gen. Schwarzkopf could describe 700,000 troops facing 500,000 troops as being "outnumbered 2 to 1." It was even more amazing that the *Times* accepted his "new math." Schwarzkopf then speculated that there must have been as much as 30 percent desertions, because, when the allies attacked, the Iraqi troops were not as numerous as had been announced. Mass graves, as in Panama, will serve U.S. interests once more.

The Body Count

The Pentagon has ordered a study of how many Iraqi soldiers were killed, but as with every phase of this war, the real target of the disinformation, the American people, will never find out what their government has wrought. More than 100,000 U.S. troops still occupy southern Iraq and, without international supervision, are supposedly counting the bodies as they bury them. Schwarzkopf said of the "savage and redundant bombing" only that there were "a very, very large number of dead ... in the front lines" (John Broder, *Los Angeles Times*, February 28, p. 1).

But for many of us, that will not do. The *New York Times* featured the death toll of Iraqi troops at a rather conservative 25,000 to 50,000 (John H. Cushman, Jr., March 1, p. 1), but, Cushman said, "it could have been far worse."

Doug Ireland, tabulating the body count in the *Village Voice*, (March 19, p. 8), noted that a Saudi military commander told CNN that about 100,000 Iraqi soldiers were killed and twice that number wounded. NBC's Fred Francis gave a figure of 150,000 dead, and *Le Nouvel Observateur* cited a French military intelligence figure of 200,000 dead. The *Times*'s figure is thus from one-half to one-eighth of all the other estimates.

Despite frequent warnings in the *Times* that deadly Iraqi resistance was a constant threat, it was certainly no surprise to any of the military commands—and probably little to the corporate media—that the Iraqi military could not respond, either to defend themselves or to retreat as they were penned in and attacked by these hideous weapons of mass destruction. Indeed, the subsequent reports of "ferocious" fighting by the Iraqis turned out to be utterly false. Other papers were reporting the opposite, that Iraqis were trying desperately to surrender but often not given the chance. The *Times*'s twist simply helped justify the president's refusal, throughout the killing, to agree to a cease-fire.

Feigning indecision each step of the way, George Bush led the world inexorably, pseudo-deadline by pseudo-deadline, to the decimation of a people. His plan was never merely to drive Iraq from Kuwait, but "to crush a crippled adversary"; the plan "contained no intermediate objectives or 'firebreaks' where action would pause to allow an orderly Iraqi withdrawal" (Melissa Healy and John M. Broder, "Allied Assault Mapped to Rout Crippled Foe," *Los Angeles Times*, February 24, 1991, p. 1).

Jonathan Schell speculated (*Newsday*, February 24, p. 37):

> One day, a historian will chronicle how ... President George Bush acted without consultation or advance notice to the public ... how each action was used to create pressure for the next ... how the press ... fell in step with [the President's] slightest suggestion, as if under the spell of a hypnotist.... And ... how every major actor on the world stage ... was carried along by the president and led to ... participate in a war that not one ... wanted....

Schell's expectations of future American soul-searching may be too optimistic. This country has never really repented its wars—not the Mexican War, the Spanish-American War, or the Vietnam War, to name a few of the least justifiable. More likely, the people of the Middle East alone will remember with bitterness that bright, shining hour of U.S. death-dealing which was the Gulf war.

The people of Iraq will be reminded daily of what was done to them, as they struggle to pull themselves out of the Dark Ages, trying to rebuild an infrastructure wantonly and deliberately destroyed. Sewer, water supply, and electrical systems will take years to reconstruct, while perhaps a quarter of the nation's young men have been killed or maimed. ●

The author wishes to thank Mae Churchill, who assisted in the research.

The New Weapons

What were the deadly weapons referred to above and *never* described in the *New York Times* in anything but the most innocuous manner? The *Los Angeles Times*, in a 61-column-inch piece (Ralph Vartabedian, "Ordnance: High Tech's Gory Side," February 24, p. A1), gave a blow-by-blow description of their terrifying power:

- "Improved conventional munition" (ICM) bomblets "have an estimated 50% probability of killing a soldier at 15 meters ... the ICM can kill four times an many soldiers."
- Adam is one of the "so-called bouncing or bounding ordnance systems, designed to detonate at groin level and spray shrapnel at an elevation that is more damaging to vital human organs." Adam, and the other "Bouncing Betty" bombs, hit the ground and then are propelled upward to the most lethal level before they detonate.
- The Beehive, "perhaps the ultimate concept in improved fragmentation ... spins at high velocity, spitting out 8,800 flechettes—tiny darts with razor edges capable of causing deep wounds."
- White phosphorus howitzer shells spew forth fragments which "can continue to burn hours after they have penetrated a soldier's body, creating deep lesions."
- And finally, the "fuel-air explosive" which creates "a huge pressure shock that can knock down buildings and exceed the 90-pound-per-square-inch lethality limit for humans."

As Vartabedian noted, "The mechanics of death and destruction are a grim affair. The military's scientific approach and its philosophics—for example, its preference for wounding vital organs over blowing off limbs—can be deeply disquieting to anybody who imagines such matters are left to chance. Many people would rather not know about the gruesome details." ●

The Boston Globe
TUESDAY, APRIL 16, 1991

Weapons Ch 7 (C-read

The surgical myth of the Gulf War

PAUL F. WALKER
and ERIC STAMBLER

The first images of the 43-day Persian Gulf War mesmerized most viewers: television pictures of targeted Iraqi bunkers and buildings, many in downtown Baghdad, being "surgically" destroyed by precision-guided bombs dropped from stealthy aircraft. As the crosshairs of an aircraft high-tech laser targeting system lined up on the rooftop of the Iraqi Ministry of Defense, a laser-seeking 2,000-pound bomb blew the building apart moments later. While US Gen. H. Norman Schwarzkopf described this attack with a wry, amused smile, hundreds of news reporters in the Saudi military briefing room laughed with nervous interest as if viewing Nintendo games. High-tech warfare had come of age.

Coalition forces undertook thousands of aircraft sorties and missile strikes in the first days of the war, a select number of the successful ones with laser-guided bombs portrayed daily back home on the news.

These images created an impression of remote, bloodless, push-button battle in which only military targets were destroyed. Pentagon officials stressed that coalition war planners were taking great pains to match weapon to target in order to minimize "collateral damage," that is, harm to civilians in Iraq and Kuwait. The Wall Street Journal editorialized that "advanced weapons spare civilians." One journalist described the conflict as a "robowar." And US officials suggested once that Iraq could be faking destruction in a play for international sympathy.

Indeed, if one looks at the small number of US casualties, these observations of little damage and killing might appear on the mark. Only 131 American troops were listed as killed in action; If one includes missing, wounded, friendly fire, and non-combat deaths, this total rises to about 2,350 casualties.

Yet, in spite of these public perceptions of limited casualties from so-called "surgical" and "precision" strikes, there would appear to be much higher numbers of dead and injured in Iraq and Kuwait. Gen. Merrill McPeak, US Air Force chief of staff, proclaimed last month that the war marked "the first time in history that a field army has been defeated by air power," and estimated that 88,500 tons of bombs had been dropped in 109,876 aircraft sorties. At 59,000 tons a month, this is considerably more intense than the 34,000 tons per month dropped during the Vietnam War and the 22,600 tons per month dropped during the Korean War. In Vietnam, deaths averaged one for every two tons of explosive; in Korea, nearly four per ton. Schwarzkopf has talked of more than 100,000 casualties in the gulf, yet no US official will yet go on record concerning "body counts."

Also of the 88,500 tons of bombs dropped, only 7.4 percent (6,520 tons), according to official Pentagon figures, were so-called "precision-guided ordnance." Therefore, 82,000 tons of bombs were less than surgically aimed; this figure is still no doubt low if one considers the less than perfect accuracy and reliability (between 20 percent and 90 percent) of the precision-guided weapons.

The first visible display of the destructiveness of warfare, among many others such as the Scud attacks in Israel and Saudi Arabia, was the carnage wreaked by attacking aircraft and helicopters on fleeing Iraqi troops on highways out of Kuwait City on Feb. 25 and 26.

More than 1,500 Iraqi tanks, armored vehicles, trucks, jeeps, ambulances and automobiles were destroyed along several miles of highway running between Kuwait City and Umm Qasr in Iraq, victims of several hours of air attacks with conventional bombs and rockets. In contrast to emotionally remote television images of smart bombs, hundreds of charred and twisted bodies were visible among the ruins.

Military troops and equipment were the primary targets and by most accounts the highway casualties consisted largely of retreating Iraqi forces. Yet it is clear from preliminary post-war damage assessments that destruction went far beyond military facilities and personnel. Many of the critical targets in Baghdad and other cities were civilian, although not so defined by the military: communication centers, utilities, power grids, bridges, highways, and airports.

Another major reason for the widespread

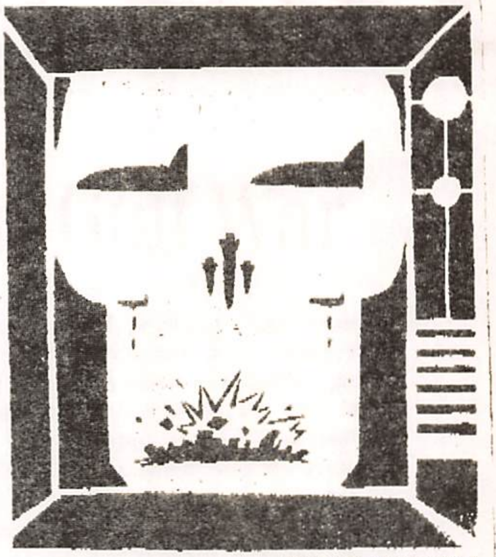
damage, described as "near-apocalyptic" by a recent United Nations report, lies in the types of weapons used. The military has not provided a breakdown of these weapons but an Air Force spokesman has acknowledged that "the full complement of tactical munitions was employed throughout Desert Storm" and that he "wouldn't disagree with" a long list of destructive air-launched ordnance presented to him for confirmation.

One of the most common "workhorse" weapons dropped by coalition forces was the "cluster bomb." Rather than a single large explosion, these bombs contain dozens, hundreds, and sometimes even thousands of mini-bombs or "bomblets," essentially high-tech grenades designed to spread devastation over wide areas of territory. Spread over a much greater area, the cluster bomb inevitably kills larger numbers of dispersed individuals and/or equipment. Many of these bomblets apparently remain unexploded and continue to cause injury and death to troops and civilians alike throughout Kuwait and Iraq.

Another group of weapons utilized were fuel-air explosives or FAEs. FAEs form highly gaseous mixtures which, for their size and weight, provide much larger blast effects than any other weapon except for nuclear devices. They are therefore commonly referred to as the "poor man's nuclear weapon." They were first widely used in Vietnam to destroy Vietcong tunnels, previously impervious to fragmentation bombs, and to clear heavily wooded areas for helicopter landing sites.

A unique bomb which also provides tremendous blast overpressures and was reported to have been used in the Mideast ("a favorite of the Marine Corps," according to one anonymous Pentagon spokesman) is the BLU-82, otherwise known as "Big Blue 82" or "Daisy Cutter." It can only be launched from a cargo aircraft by rolling it out the rear door on a parachute. Its 12,540-pound warhead produces blast overpressures of 1,000 pounds per square inch, literally disintegrating everything within hundreds of yards. Just a few pounds overpressure is sufficiently lethal for humans and will seriously damage most structures.

It will be some time before the full extent of damage in Iraq and Kuwait will be known, but it is likely to be much greater than assumed. The large amount of explosive tonnage dropped in the region, over 90 percent of it non-precision-guided, belies any image of precise military surgery. The continuing lack of accurate information regarding the success and reliability of the precision-guided ordnance only adds to this fact. And the intensity of the air campaign with over 2,500 sorties flown on average per day, and the high-tech destructiveness of the cluster weapons, fuel-air explosives, and blockbuster bombs must have wreaked incredible damage.



PETER KUPER ILLUSTRATION

The Gulf War was not an antiseptic Nintendo game, not an impersonal conflict with little "collateral" damage, not a contest dominated by selective, precision-guided munitions which discriminated between human beings in and out of military uniform. Still, the human face of this war, to use John Keegan's term from "The Face of Battle," must be better revealed before this war can be properly understood and appropriate lessons drawn for history or any new world order.

This was not a surgical war; this was a killing ground, a slaughter.

History may judge high technology the winner, but human beings were certainly the victims.

Paul F. Walker is director and Eric Stambler is a research assistant of the Institute for Peace and International Security in Cambridge. This column is excerpted from an article in the Bulletin of the Atomic Scientists.

. . . AND THE DIRTY LITTLE WEAPONS

By PAUL F. WALKER and ERIC STAMBLER

Cluster bombs, fuel-air explosives, and "Daisy Cutters," not laser-guided weapons, dominated the Gulf War.

The first images of the 43-day Persian Gulf War mesmerized television viewers: nighttime pictures of Iraqi bunkers and buildings, many in downtown Baghdad, being "surgically" destroyed by precision-guided bombs dropped from stealthy aircraft. Coalition forces undertook thousands of aircraft sorties and missile strikes in the first days of the war, and a select number of the successful laser-guided bomb strikes were portrayed daily back home on the news. Similarly, American technical prowess was graphically displayed as Patriot air-defense missiles intercepted Iraq's modified versions of Soviet Scud missiles launched against Saudi Arabia and Israel. High-tech warfare had come of age.

These images created the impression that the war was a bloodless, push-button battle in which only military targets were destroyed. Pentagon officials stressed in daily briefings that coalition war planners were taking great pains to match weapon to target in order to minimize "collateral damage," that is, harm to civilians in Iraq and Kuwait, particularly in cities. Halfway through the war journalist Gregg Easterbrook described the conflict as a "robowar"; that is, "the raids are intense, unremitting, and conducted with the world's most advanced non-nuclear weaponry, but it is unlikely they have caused the sort of general destruction being anticipated by commentators—vast expanses of carnage, smoking craters, and blackened obliteration." He went on to explain that in the first five days of Desert Storm, coalition air forces dropped some 15,000 tons of explosives on Iraq, but Iraq reported only 41 civilian deaths. "Despite public perceptions, the recent history of high-tech conventional warfare has been toward steadily reduced general destruction."[1] The January 21 *Wall Street Journal* editorialized that "advanced weapons spare civilians," while the *Washington Post* quoted U.S. officials on February 18 suggesting that Iraq could be faking destruction in a play for international sympathy.

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The road from Kuwait City to Basra.

U.S. and allied press briefings have emphasized that most targets were military—air and ground weaponry and the Iraqi field army. Clearly there was no carpet bombing of downtown Baghdad. Yet, the briefers and ground observers also noted that targets of the air campaign were spread throughout Iraq and Kuwait, far beyond border military deployments. Many sites had civilian functions and were located in civilian populated areas—electrical power plants and grids, communications facilities, air defense and missile sites, airports and runways, military and political command centers—making it difficult, if not impossible, to preclude noncombatant casualties. These are the areas where the U.S. government has claimed "surgical" bombing and has been completely unwilling to provide target lists and casualty and damage assessments. Thus, the full extent of Iraqi civilian, as well as military, casualties from the Gulf War remains unknown.

The strikingly low loss of life on the U.S. side—and the fact that neither side used nuclear, chemical, or biological weapons except for some Iraqi chemical mines—contributed to the perception that casualties were limited in the war. But early first-hand accounts gave a different glimpse of what was happening in Iraq. Capt. Steve Tate, pilot of an F-15 jet fighter which escorted the first wave of bombers and who was the first American to shoot down an Iraqi plane, described his bird's-eye view of Baghdad after the first hour of allied bombardment: "Flames rising up from the city left some neighborhoods lit up like a huge Christmas tree. . . . The entire city was just sparkling at us." Fellow F-15 pilot Lt. Col. Don Klein, commander of the 27th Tactical Fighter Squadron which participated in the first attacks, exclaimed that Baghdad "looked awesome. . . . There were things going off all over the place. There were a bunch of explosions, quick as they were going off. I couldn't count. . . . If you saw any of the footage from World War II, that's exactly what it looks like."[2]

The raids described above do not suggest "surgical" or "precision" strikes in urban areas. And the amount of ordnance used there has not been distinguished from the overall tonnage dropped. Gen. Merrill "Tony" McPeak, air force chief of staff, proclaimed in a March 15 briefing that the war marked "the first time in history that a field army has been defeated by air power" and estimated that some 88,500 tons of bombs had been dropped in 109,876 aircraft sorties. At 59,000 tons a month, this is considerably more intense than the 34,000 tons per month dropped during the Vietnam War and the 22,000 tons per month dropped during the Korean War. In Vietnam, deaths averaged one for every two tons of explosive; in Korea, nearly four per ton. Gen. H. Norman Schwarzkopf has talked of over 100,000 casualties in the Gulf; U.S. military officials say damage assessment is continuing. But the outbreak of civil war has made that assessment more difficult, if not impossible.

Before the Gulf War, American commanders in Saudi Arabia in December portrayed an "air-land battle" which would include bombing and strafing of Iraqi command and control centers, troops, and supply lines; carpet-bombing by B-52 bombers based in Diego Garcia to clear Iraqi minefields; dense artillery fire, including laser-guided Copperhead shells and the new multiple launch rocket system; Cobra and Apache attack helicopters firing dozens of missiles and rockets; A-10 attack planes belching 4,000 rounds per minute of 30-millimeter cannon fire; navy battleships firing 2,000-pound shells from the Gulf; and both surface ships and submarines launching Tomahawk cruise missiles with 1,000-pound homing warheads.

One general commented: "When you concentrate that kind of firepower, you can kill an entire regiment in less than five minutes." Other officials said the air campaign would turn the area between Basra and the Kuwait border into a "parking lot."[4] Gen. Thomas Kelly commented concisely on February 23 that by the time the Iraqi army was forced out of Kuwait, "there won't be many of them left."[5] While much of this rhetoric may have been aimed at intimidating Saddam Hussein, the war as it was fought was probably closer to these plans than most televised pictures suggested.

In fact, one of the most horrifying images of the war was the "parking lot" created when aircraft, helicopters, and ground forces attacked Iraqi troops fleeing on highways out of Kuwait City February 25 and 26. Over 1,500 Iraqi tanks, armored vehicles, trucks, jeeps, ambulances, and automobiles were destroyed along several miles of highway running between Kuwait City and Umm Qasr in Iraq, victims of several hours of air attacks. In contrast to the emotionally remote TV pictures of smart bombs, these photos showed hundreds of charred and twisted bodies among the ruins.

Military troops and equipment were the primary targets—and by most accounts the highway casualties consisted largely of retreating Iraqi forces. Yet it is clear from preliminary postwar damage assessments that destruction went far beyond military facilities and personnel. Many of the critical targets in Baghdad and other cities were civilian, although not so defined by the military: telephone and other communication centers, utilities and power grids, bridges and highways. [redacted] railroad and highway bridges between [redacted] were damaged or rendered inoperable by air bombardment. Highways and surrounding areas were bombed in the air force search-and-destroy missions against Iraqi mobile missile launchers. A U.N. report issued in mid-March described "near apocalyptic" damage to Iraq's infrastructure which has relegated the country to a "pre-industrial age." According to the survey team report, the destruction of 9,000 homes has left some 72,000 Iraqis homeless.

> Of the 88,500 tons of bombs dropped, only 7.4 percent were precision-guided ordnance. The rest were very destructive conventional weapons.

As General McPeak explained in his briefing on retreating Iraqi forces, "When enemy armies are defeated, they retreat, often in disorder, and we have what is known in the business as the exploitation phase. It's during this phase that the true fruits of victory are achieved from combat. . . . It's a tough business. . . . It often causes us to do very brutal things—that's the nature of war."

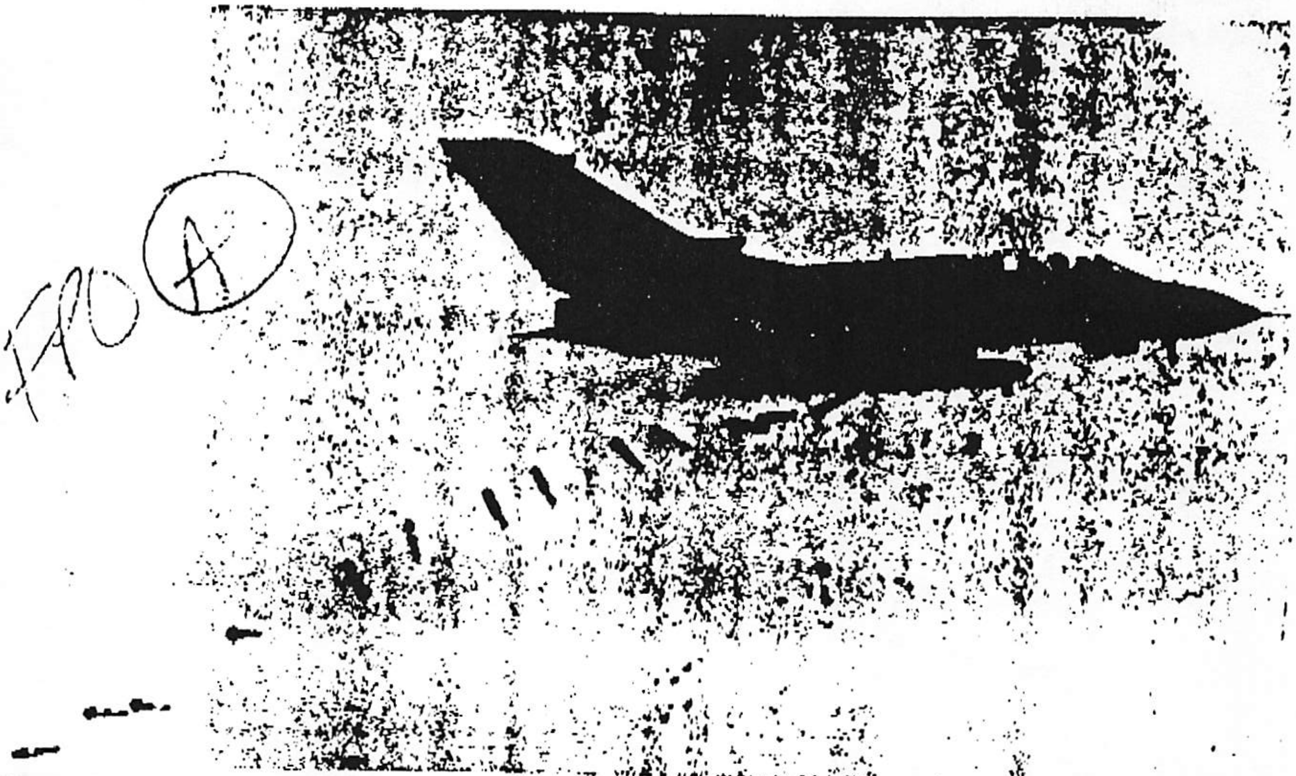
But another major reason for the widespread damage lies in the of weapons used. Precision-guided tions—the Mavericks, Hell TOWs, and other such missiles—w used against selected targets such as tanks, armored personnel carriers, and other "hard targets." But the strikes against ground troops, armored formations, widespread defenses, and other large targets, many located in civilian areas, were undertaken with less discriminating weapons.

One little-known fact is that of the 88,500 tons of bombs dropped, only 6,520 tons—7.4 percent—were precision-guided ordnance, according to official Pentagon figures. Most of the weapons used were conventional, and very destructive, bombs and artillery. The military has not provided a breakdown of the weapons used but an air force spokesman has acknowledged that the "full complement of tactical munitions was employed throughout Desert Storm" and that he "wouldn't disagree with" a long list of destructive air-launched ordnance presented to him for confirmation that they were used in the war. This list included all the weapons mentioned below. Recent press reports of postwar military and civilian casualties caused by unexploded "bomblets" appear to confirm wide use of antipersonnel weapons.

One of the most common "workhorse" weapons was the "cluster bomb unit" (CBU). These weapons have been gradually refined over the last three decades to deliver explosions lethal to personnel and equipment over expanded areas. Instead of a single large explosion, these bombs contain dozens, hundreds, and sometimes thousands of bomblets called BLUs (bomb live units), essentially high-tech grenades designed to spread devastation over wide areas.

Today's aircraft may carry a cluster bomb unit filled with 1,800 one-pound bomblets such as the BLU-26 Sadeye—a cast steel shell with aerodynamic vanes and 0.7 pound of TNT in which 600 razor-sharp steel shards are imbedded. The Sadeye can be equipped with fuses to explode upon impact, several yards above ground, or some time after landing. It is lethal up to about 40 feet. Thus a container of 1,800 Sadeyes, called a CBU-75, disperses destruction

Intro — TARGETS
following pgs talk specifically about
Cluster bombs, etc.



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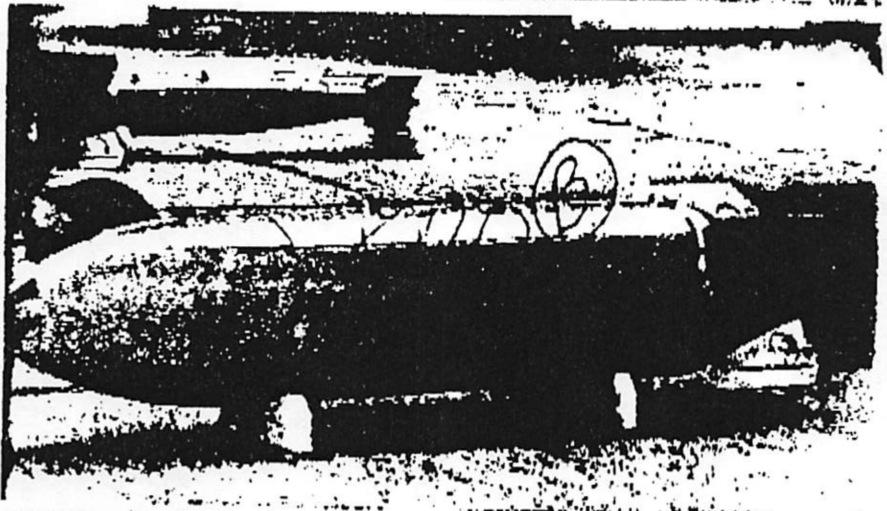

JANE'S INFORMATION GROUP

AVIATION WEEK & SPACE TECHNOLOGY

Directly above, worker loading the 950-pound BLU-87/B with 202 "bomblets," including armor-piercing charges and antipersonnel fragments. At left, 500-pound cluster bomb. Top: Tornado dropping cluster bombs.

over more than double the territory of the standard 2,000-pound bomb. A typical bomb is the 2,000 pound Mk-84, developed in the 1950s. The Mk-84 creates a crater 50 feet in diameter and 36 feet deep or, exploding before it hits the ground, disperses shrapnel to a lethal radius of 400 yards.

A wide variety of cluster bombs has been developed since they were first designed in the 1960s as successors to simpler fragmentation or antipersonnel bombs. The bomblets can be dropped en masse to disperse themselves with their aerodynamic fins, or they can be spewed out by compressed air in streams behind the plane. Some use parachutes or drogues to slow their descent; some are equipped with shaped charges for use against hardened targets such as tanks. Others can bounge 10 feet or more after impact to scatter antipersonnel shrapnel. Some are designed to disperse smoke, napalm, or chemical agents, and other models are mines with delayed fuses or acoustic or seismic sensors for use against tanks.

The Rockeye II is a 750-pound unit carrying 717 antitank fragmentation bomblets which can distinguish between soft and hard targets; one F-15E fighter/bomber can carry as many as 22 Rockeyes. The CBU-58 caries 650 Sadeyes; the CBU-52/B carries 254. The striking feature all share is their wide area coverage: the CBU-52/B can cover 1.8 million square feet, equal to over 22 football fields. The CBU-75 covers the equivalent of 157 football fields.

One 950-pound cluster bomb, the CBU-87, was described by air force officials as the weapon of choice in the Middle East. This "combined effects munition" carries 202 bomblets, the BLU-97/B. Each 3.4-pound bomblet carries a triple punch: a prefragmented antipersonnel casing to spray deadly shrapnel; a hollow-charge antitank warhead; and a disc of incendiary zirconium to add a fiery finishing touch. The air force claims one such bomblet will disable heavy vehicles over a 50-foot radius and aircraft over a 250-foot radius. Troops would be still more vulnerable at greater ranges.

A single B-52 strategic bomber can carry 40 such cluster bombs, with a total of 8,080 bomblets. Theoretically, assuming a danger radius of 250 feet, one B-52 could carpet-bomb over 176 million square yards, equal to 27,500 football fields. The 28 B-52s which reportedly dropped 470 tons of explosives on Iraqi ground forces on one day, January 30, could have obliterated 1,600 square miles, an area one-third the size of Connecticut.

Fuel-air explosives were another group of weapons used against Iraq. The U.S. Central Command says they were used to clear minefields in Kuwait throughout the war, although it is reluctant to identify the specific weapons used.

Predecessors to fuel-air explosives were incendiary or fire bombs, weapons filled with highly flammable material such as thermite, magnesium powder, or napalm—a mixture of gasoline and benzene with aluminum or polystyrene soap as a thickener. These weapons would spread fire over wide areas and, when ignited in restricted areas such as bunkers, would consume so much oxygen that victims who were not burned to death would suffocate.

Fuel-air explosives form highly gaseous mixtures which, when detonated, produce much more blast than fire. For their size and weight, they provide a much larger blast than any other weapon except for nuclear devices; in fact, the blast can mimic a small nuclear explosion. They were first widely used in Vietnam to destroy Vietcong tunnels and to clear heavily wooded areas for helicopter landing sites. Some are launched from aircraft, others from helicopters or ground vehicles.

For example, the appropriately named MAD FAE (mass air delivery fuel-air explosive) consists of 12 containers of ethylene oxide or propylene oxide trailed behind utility helicopters. The containers release a cloud of highly volatile vapors which, when mixed with air and detonated, can cover an area over 1,000 feet long with blast pressures five times that of TNT. A surface unit consists of an armored vehicle with 30 launch tubes for five-inch Zuni rockets equipped with fuel-air munitions to detonate mine fields. U.S. inventories also include an air-dropped unit of three 100-pound canisters filled with ethylene oxide. A proximity fuse bursts the canisters 80 feet above ground and disperses an aerosol cloud more than 2,500 cubic yards in volume which is detonated a few inches above ground by a second charge. The blast overpressures of 800 pounds per square inch will flatten everything within a 60-foot radius and kill any troops nearby, both above and below ground. Just a few pounds overpressure is lethal for humans.

One "favorite of the Marine Corps" in the Mideast, according to an anonymous Pentagon spokesman, was the BLU-82, known as "Big Blue 82" or "Daisy Cutter." Last used in Vietnam by U.S. Special Forces for clearing helicopter landing sites, the 15,000-pound bomb is filled with an aqueous mixture of ammonium nitrate, aluminum powder, and polystyrene soap. It can only be launched from a cargo aircraft, the MC-130 Hercules, by rolling it out the rear cargo door. The bomb descends by parachute and detonates just above ground, producing blast overpressures of 1,000 pounds per square inch and disintegrating everything within hundreds of yards. It can be used to clear minefields or against concentrations of troops, aircraft, and equipment. How many of these blockbusters were actually used is still unknown.

Another widely used weapon was the multiple launch rocket system (MLRS), a mainstay of ground force operational plans: the army has purchased almost 500,000 of these rockets over the past decade and deployed them to Europe and Korea. The MLRS is a sophisticated artillery gun capable of firing more deadly warheads faster, farther, and more accurately t   s predecessors. About 115 were dep.   d and "several thousand rockets fired   the Gulf War, according to U.S. military officials. The tracked vehicle carries 12 rockets, each containing 644 submunitions: small antipersonnel bomblets not much larger than a 35-millimeter film canister which individually can saturate an area 220 yards in diameter, according to the manufacturer. A full 12-rocket volley can spread more than two tons of firepower over an area the size of six football fields in one minute.

The full extent of war damage in Iraq and Kuwait will not be known for some time, if ever. But much of what we know now challenges the assumption that the war was an antiseptic Nintendo game, an impersonal conflict with little "collateral" damage, or a contest dominated by selective, precision-guided munitions which discriminated between human beings in and out of military uniform. Large amounts of explosive tonnage were dropped in the region, over 90 percent in the form of weapons that were not precision guided—and we do not have accurate information on the success and reliability of precision-guided ordnance. The intense air campaign, with over 2,500 sorties flown on average per day, and the high-tech destructive weapons must have wreaked incredible damage.

We have some first-hand descriptions from war refugees and returning Americans that bear this out, as well as a few gruesome examples that appeared on television screens and in news photos. Still, the human face of this war, to use John Keegan's term from *The Face of Battle*, must be better revealed before it can be properly understood and appropriate lessons drawn for history. This was not a surgical war; it was a slaughter. History may judge high technology the winner, but human beings were certainly the victims. ■

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1. Gregg Easterbrook, "Robowar," *New Republic* (Feb. 11, 1991), p. 17.
2. Philip Shenon, "Allied Fliers Jubilantly Describe Their Command of Iraqi Skies," *New York Times*, Jan. 18, 1991, p. A10.
3. Quoted in George J. Church, "If War Begins," *Time* (Dec. 10, 1991), pp. 29–30.
4. Quoted in Michael Kinsley, "TRB from Washington: Dead Iraqis," *New Republic* (March 18, 1991), p. 6.

By Casey Anderson
Times staff writer

CAMBRIDGE, Mass. — Air Force planners are considering changing the service's combat doctrine to adapt the sudden and overwhelming strategic air campaign used so successfully in the Persian Gulf War for future military operations.

Known as "hyperwar," the new doctrine would call for air forces to bombard air defense networks, telephone systems, electrical generating plants, and other targets normally located deep in enemy territory, Air Force officials at a Tufts University conference here said.

"The idea is to achieve near-instantaneous paralysis of the enemy's war-fighting capabilities," said one Air Force official who asked not to be identified.

Although the concept has not undergone official review, senior Air Force officers here said the war against Iraq demonstrated the viability of the idea, and some said the conflict in the Persian Gulf was nearly certain to become a model for decades to come.

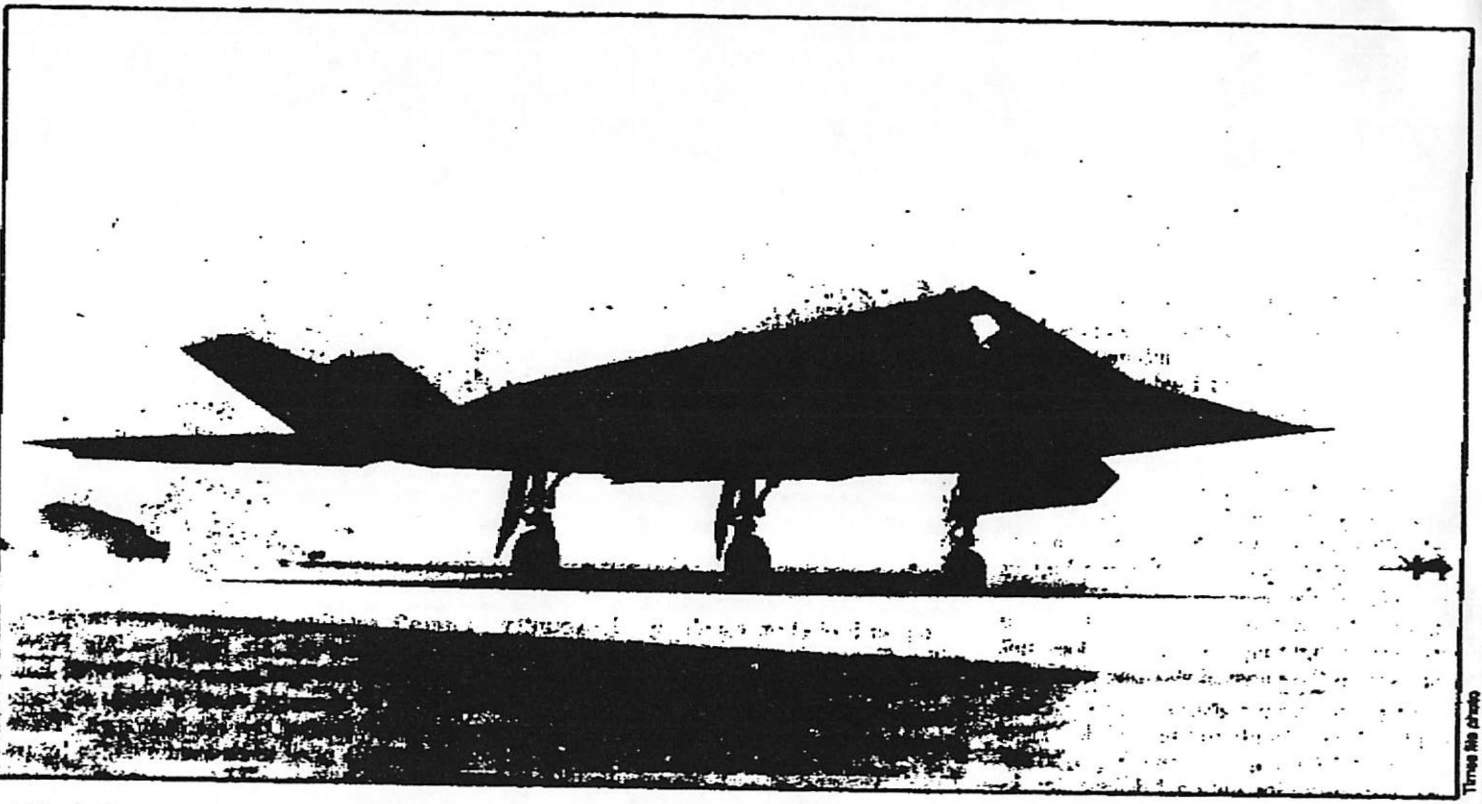
"It has established the model for operations above the guerrilla level for the next quarter century," said Col. John Warden, Air Force deputy director for war-fighting concepts.

Warden said technological advances — principally radar-evading stealth technology and the development of precision guidance systems for conventional weapons — have made strategic air warfare with conventional weapons more effective than ever before.

Stealth enabled the Air Force's F-117A fighter-bomber to strike air defense networks before the Iraqis knew the attack was under way, Warden said, and precision guidance allowed the allied air forces that followed to knock out other targets quickly.

"Stealth returns genuine tactical and operational surprise to warfare, and precision enabled us to destroy virtually every critical strategic node with only a few sorties," he said.

Edward Luttwak, an analyst for the Center for Strategic and International Studies which is based in Washington, D.C., agreed. "Desert Storm marks a true turning point," he said. "What happened in Desert Storm was not a fluke."


Times file photo

F-117A: Stealth technology has given the Air Force a "genuine and operational surprise to warfare," said Col. John Warden.

Luttwak said the dramatic effectiveness of the strategic air campaign might not be as easy to achieve in future wars because opposing military leaders will adapt the way they fight in light of the disastrous failure of the Iraqi military.

Nonetheless, he said, the Persian Gulf War demonstrates that air power has finally come of age after "70 years of overpromising" because stealth and precision have enabled air forces to apply force decisively in large-scale conventional wars.

Warden said the approach used in Iraq would not be applicable to counterinsurgencies or other low-intensity conflicts, but it could be used against any developed country.

"I don't think you can posit an industrialized power that could be our enemy within the next 20 years, but if you could, we'd probably be able to do the same thing to them that we did to Iraq," he said.

"The offense has been returned to a primary place in military operations, and that revolution has occurred in a conceptual way as much as a technological one."

Other Air Force sources agreed, saying the vulnerability of a society to attacks on centralized and easily identified strategic targets such as communications networks increases as the economy becomes more developed.

"Hyperwar is not necessarily applicable to guerrilla operations, which are usually fought in less developed countries," said another Air Force planner.

Lt. Col. Michael Gannon, an Air Force spokesman at the Pentagon, said the service had not made any decisions on doctrinal changes as a result of lessons from the gulf war.

"There will be some things that will change, I'm sure, but it's really too early to say" what they will be, Gannon said.

Gannon acknowledged, though, that the approach used against Iraq was receiving close attention from planners.

Warden is an articulate advocate of the offensive operational doctrine embodied by the hyperwar concept.

Some Air Force sources, however, said the close association of Warden and his ideas with former Air Force Chief of Staff Michael J. Dugan has slowed the service's acceptance of the concept.

Dugan, who was one of the first to use the term hyperwar, was known as a proponent of the ideas advanced by Warden.

One Air Force source said the ideas were enjoying a resurgence in credibility as the "chilling" effect of Dugan's firing faded with time.

SLAMs Hit Iraqi Target In First Combat Firing

NEW YORK

An initial lesson learned from the Persian Gulf war—that precision-guided missile warfare has come of age—was reinforced by the successful first combat use of two Standoff Land Attack Missiles and the precision with which they struck their target.

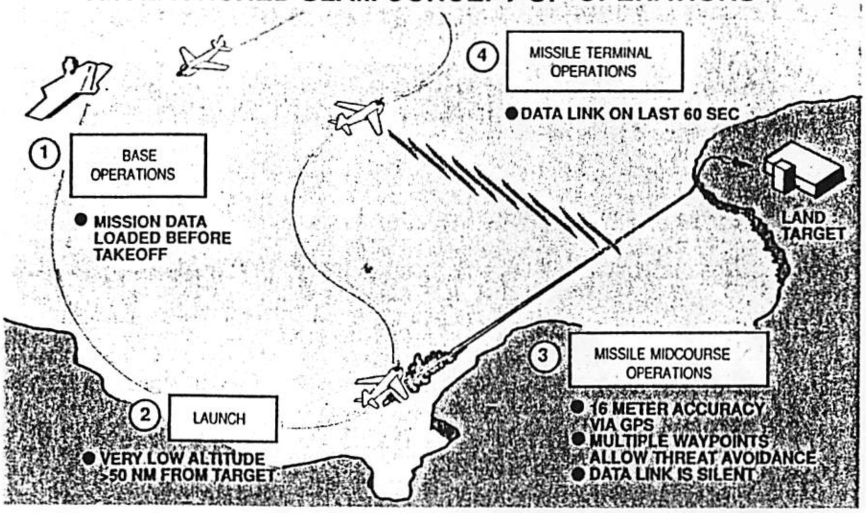
The McDonnell Douglas SLAMs were directed against an Iraqi hydroelectric plant early in the war, and the rationale for their employment against this site was twofold: The weapons enabled attacking pilots to hit the heavily defended target without exposing them to enemy defenses. And the SLAM's accuracy minimized the possibility of civilian casualties. The high precision of the missiles permitted pilots to destroy the power-generating facility without damaging an adjacent dam.

SLAM, a derivative of the Harpoon antiship missile, was developed as a low-cost, low-risk interim standoff weapon for the U. S. Navy. Designed to thwart antiaircraft defenses, the aircraft-launched missile has a range of more than 60 naut. mi. after release and is equipped with a 500-lb. warhead that can be fuzed for instantaneous or delayed detonation. The weapon can be carried and fired from A-6Es and F/A-18s, and it can be controlled from these aircraft and A-7Es. A ship-launched version also has been tested (AW&ST Sept. 3, 1990, p. 195).

The service's requirement for the missile and the streamlined acquisition process that brought it into the naval inventory were a consequence of the April, 1986, raid on Libya. The first SLAM was delivered in November, 1988, and a full-scale production contract is expected to be signed in this fiscal year. Production deliveries would begin about 24 months later. To date, McDonnell Douglas has delivered fewer than 100 of the weapons to the Navy.

Commonality between the SLAM and Harpoon is high—the two missiles share common control, sustainer and warhead sections. The main differences lie in the guidance sections. SLAM retains the Harpoon's radar altimeter and midcourse guidance unit, but the new missile also is fitted with several pieces of off-the-shelf equipment that are vital to its standoff role. These include a production version of the Maverick missile imaging infrared seeker, a Walleye video data link for aircraft control of the seeker, and a single-channel global positioning satellite receiver/processor that allows the missile's altitude and reference assembly to be used as an inertial navigation system.

AIR LAUNCHED SLAM CONCEPT OF OPERATIONS


1
BASE OPERATIONS
● MISSION DATA LOADED BEFORE TAKEOFF
2
LAUNCH
● VERY LOW ALTITUDE >50 NM FROM TARGET
3
MISSILE MIDCOURSE OPERATIONS
● 16 METER ACCURACY VIA GPS
● MULTIPLE WAYPOINTS ALLOW THREAT AVOIDANCE
● DATA LINK IS SILENT
4
MISSILE TERMINAL OPERATIONS
● DATA LINK ON LAST 60 SEC
LAND TARGET

The weapon can attack fixed or relocatable land targets and ships in port using preplanned mission data, or it can operate in a target-of-opportunity mode to attack ships at sea. Typically, three preplanned and one target-of-opportunity mission developed at sea is loaded into each missile, and final mission selection is made during captive flight prior to launch.

To launch a SLAM strike, mission plans are generated using standard maps and charts and a small computer, and mission data are then typed into a prelaunch data computer where the information is translated into signals compatible with the weapon's systems. The reformatted data are then transferred to a manportable prelaunch data memory loader, which can hold up to 64 missions stored in groups of four for up to 8 hr.

> *During the first combat mission, the two SLAMs were launched by an A-6E and controlled from an A-7E*

At this point, missiles are mounted on an aircraft and the data loader is sequentially attached to each missile. Mission plans are then downloaded into each missile and retained in EEPROM until purged. It takes about one-half to two hours to plan a mission, about 30 min. to load the data into the prelaunch data computer, and 5 min. to load the prelaunch data memory loader. Each missile also requires about 5 min. to acquire its mission plans. Prior to the launch of the strike aircraft, the missiles receive global positioning system (GPS) clock data that can be maintained in the weapon for up to 18 hr.

Once the attacking aircraft is airborne, it flies to an initialization point so that the missiles can acquire GPS satellites. Early acquisition prior to launch minimizes the time it takes the missiles to reacquire the satellites after launch.

Once launched, the SLAM navigates to the target using GPS. In preplanned strikes, the missile's Walleye data link and seeker become active about 1 min. before impact.

At this point, a video image of the target area is transmitted back to a control aircraft, which can be a specially designated aircraft or the one that launched the missile. The operator then guides the missile with a joystick and uses the data link to select the proper target and to lock on to an aimpoint. If the control aircraft wants to maintain data link integrity until impact, the aircraft usually has to penetrate the radar horizon of the target's defensive forces.

In target-of-opportunity strikes, the missile is launched on bearing to the target and the seeker comes on at a predetermined time, scanning at a rate of 4 deg./sec. until the operator detects a target and locks on.

During the first combat mission, the two SLAMs were launched against the target by an A-6E and controlled from an A-7E, a method of attack demonstrated in tests conducted in late 1989. Both attacking aircraft apparently were based on the USS Kennedy operating in the Red Sea.

During the attack on the Iraqi power

Weapons – SLAM
missiles

plant, the A-7E used one SLAM to blast a hole in an external wall. The second SLAM arrived at the target about 2 min. after the first missile appeared and was directed to fly through the hole made by the first missile so that it could strike at the interior of the building.

According to the Navy, SLAMs have been deployed on the Kennedy and the Saratoga. The pilot that controlled the SLAM attack from his A-7E said that a team of six pilots from the Kennedy had gone through a crash course on how to use the weapon after they reached the Red Sea in August.

While the missile has not been rushed into service—there have been more than 10 SLAM airborne test launches—it was used in combat before the Navy completed standard SLAM operational evaluations. These tests are expected to conclude next month.

Despite the superior record of the weapon in the gulf thus far, McDonnell Douglas and the U. S. Navy are considering a wide range of manufacturing and design modifications to improve performance and lethality.

Although there is no funded program to enhance the weapon, the Navy and McDonnell Douglas are examining potential performance and producibility improvements as a way of upgrading missile effectiveness and reducing future acquisition costs. While no priority has been placed on any single upgrade or package of upgrades, aerodynamic modifications are likely to be incorporated first, followed by improvements in the missile's guidance section. According to McDonnell Douglas, the Navy may be in a position to rank some of the possible modifications in a few months.

Extensive use of available hardware in the guidance section played a key role in speeding development and fleet deployment of the weapon, and this also helped contain missile acquisition costs. But the early deployment benefits accrued from using that off-the-shelf equipment have been balanced by some performance penalties, Capt. Guy Higgins, program manager for the Navy's antiship weapons, said.

INTELLIGENT INTEGRATION

The use of existing hardware added more weight to the missile than more fully integrated, purpose-built units would have, reducing weapon payload and range. In addition, the off-the-shelf items required more space than custom-built hardware. This caused the SLAM to be about 25.5 in. longer than the Harpoon, a modification that changed the missile's aerodynamics. Thus, the SLAM cruises in an inefficient, slightly nose-up attitude.

Going back and "intelligently integrating" the missile's navigation system could result in significant cost savings, Higgins said. An additional benefit would be that the increased integration would reduce equipment size, releasing space inside the missile for other purposes. This space could be used to store additional fuel for greater range, or it could be eliminated to cut the weight and length of the weapon.

The SLAM's Maverick missile seeker is another item that could change on an improved version of the weapon. Although the Navy and Air Force are now buying Maverick seekers, production is nearing an end. As production declines, the seeker cost will continue to rise. To cope with the probable cost increase, a number of other seekers with greater performance and the same or similar cost are being examined.

Aerodynamic and range improvements unrelated to the navigation and seeker changes also are being considered. One possible way to reduce the length of the missile or increase the fuel capacity of the SLAM is to shorten the missile's engine. This could be accomplished by incorporating a single-stage compressor into the Teledyne CAE turbojet. Improved throttle controls also could improve engine specific consumption, which would increase the range of the weapon.

Aerodynamic improvements would center on moving the wings forward to accommodate the increased length of the SLAM. Wing location is now optimized for the shorter Harpoon configuration. Enlarging the wing also is being considered.

A final change under review for the SLAM is the installation of a warhead more capable of penetrating concrete. ☐

Patriot System Exceeds Army's Expectations

BOSTON

The Patriot air defense system is exceeding the U. S. Army's expectations in the Persian Gulf war by successfully knocking down nearly all of the Scud missiles it engages, according to a top Army air defense official.

"No one designs for 100% and so far that is close to what we are achieving. It's amazing," U. S. Army Brig. Gen. Robert A. Drolet said. He is program executive officer for air defense systems.

Drolet also said the PAC-2 version of the Patriot missile with the improved warhead and fuze for use against tactical ballistic missiles is only available now because of an accelerated delivery schedule. Contractors Raytheon and Martin Marietta were busy fabricating the new version PAC-2 in August when Iraq invaded Kuwait, but they were not supposed to deliver the first ones to the U. S. Army until this month.

The contractors speeded up at the Army's request and began deliveries in September, 1990. No shortage of the new missile is expected to develop. "We're going to have more PAC-2s than he [Saddam Hussein] has Scuds," Drolet said. ☐

Joint U. S.-Israeli Forces Use Patriots To Defend Against Iraqi Scud Missiles

TEL AVIV

Joint Israeli and U. S. Army forces used U. S. Patriot missiles last week with mixed success to defend Israel against continuous attacks by Scud-B missiles modified by Iraq to increase their range.

The missiles struck two Scuds aimed at densely populated areas of Tel Aviv and Haifa in a campaign of terrorism.

In one attack a Scud—probably the Iraqi Al-Hussein version, which has about double the normal range—was intercepted over Tel Aviv, but the incoming warhead survived and struck a residential neighborhood. Three elderly persons died of heart attacks and some 70 others were injured.

Standard tactics call for firing two Patriot missiles at each incoming target. But when another Scud was detected the next night, a Patriot defense team "in the north of Israel" fired what was described as "several" or a "volley" of missiles in response. The Scud was successfully intercepted over an area of mixed farmland and residences.

An official of the Israeli Defense Force said that Israel now is operating several batteries of Patriots, some with entirely Israeli crews, others with mixed U. S.-Israeli crews. "I think we have at this stage sufficient Patriot missile batteries to cover those areas" that have been targeted by Iraq, the official said.

The IDF has been evaluating the Patriot as a defensive system for about a year. When the gulf war broke out, Israel had a battery in country, but it was not operational.

Seven missiles struck Haifa and Tel Aviv less than 24 hr. after the war started on Jan. 17, but damage was minimal and injuries were slight. The next day, another three missiles struck Tel Aviv. No Patriots were used to defend Israel in these attacks.

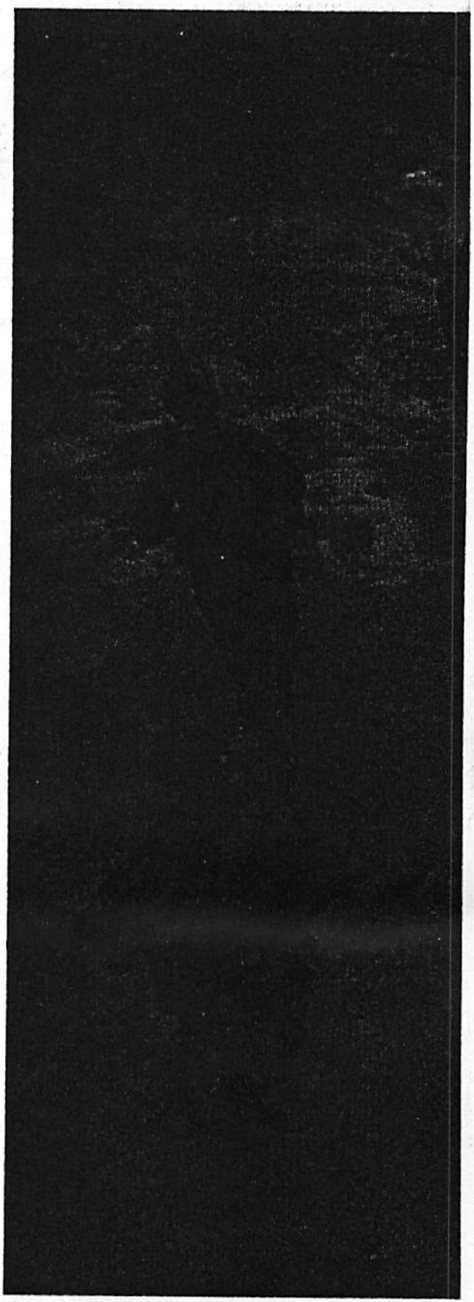
Iraq used nerve agents delivered by aircraft during the Iran-Iraq war, and Israel's main fear is that it will be the next victim. However, no clear evidence exists that Iraq has the technology to disperse nerve agents from Scud warheads. Nevertheless, residents have been issued gas masks. By late last week, only conventional warheads had been used. ☐

AP

The best. *The A-10 is neither fast nor fancy, but it's deadly against tanks*

BEST & WORST WEAPONS

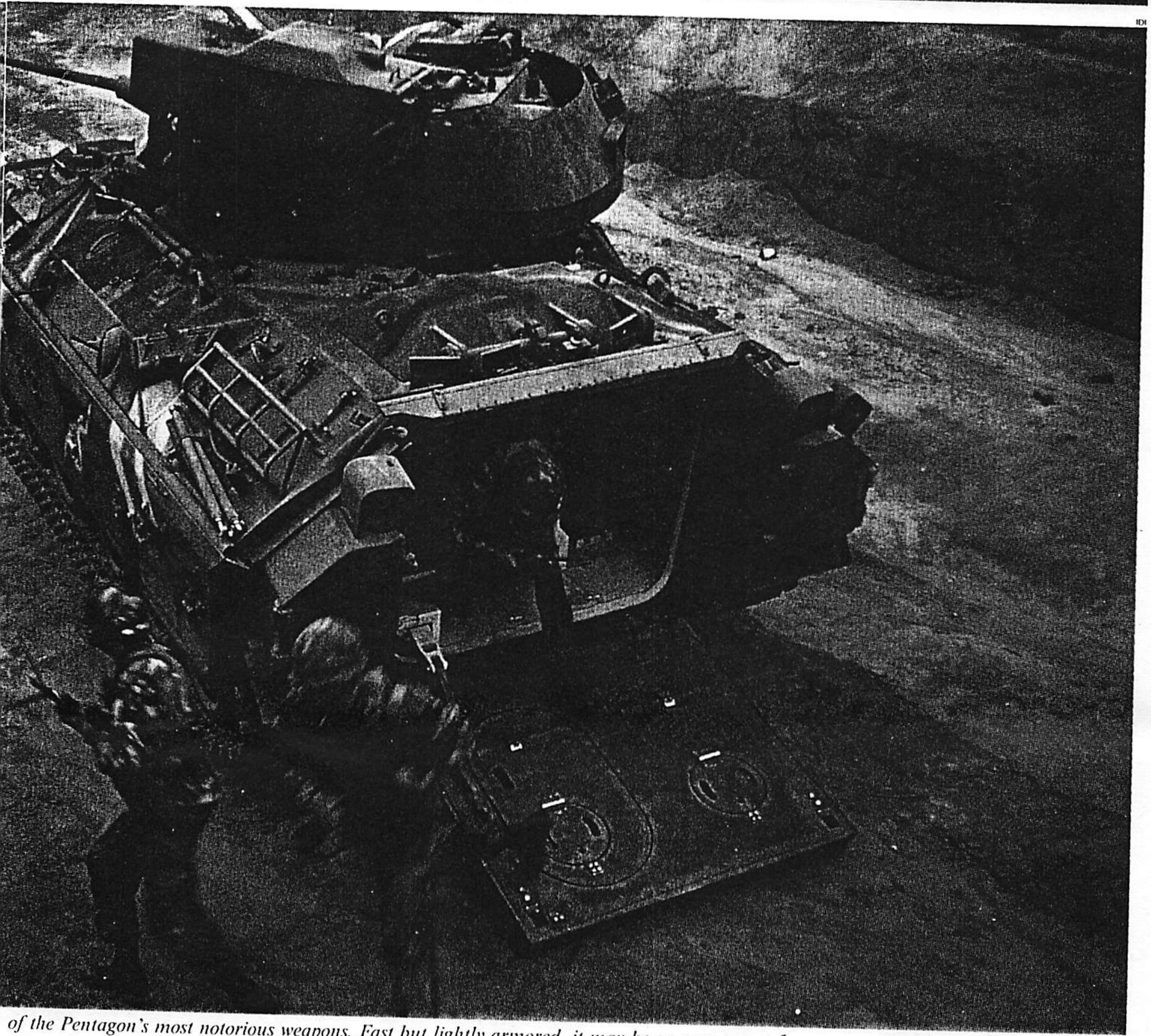
The U.S. military arsenal is still formidable, but building the right weapons for war has always been a difficult task. Now, as the pressure grows to cut the Pentagon's budget, new attention is being paid to what America is getting for its money. In some cases, the high price tag is worth it. But too often, billions of dollars are being wasted on bad weapons


The worst. *The Bradley fighting vehicle is on*

It is the second week of a superpower war in Europe in the mid-1990s. American M1 Abrams tanks have rolled to the front, but whole divisions are in trouble. Guzzling gallons of fuel per mile, these supertanks have run out of gas while their fuel trucks are stuck far behind in the mud. Nearby, the battlefield is littered with M2 Bradley fighting vehicles, some of which exploded when hit by enemy fire and others that were abandoned by GI's who decided it was safer to walk. Meanwhile, Soviet tanks are massing to punch through NATO lines. U.S. A-10 Thunderbolts, slow-flying, heavily armored airplanes once heralded as top-rate tank blasters, are long gone, phased out in favor of supersonic but fragile A-16 fighters. The new A-16s, however, have not fared well, many having been shot down while their pilots took too long aiming their high-tech Maverick antitank missiles. Outgunned and outmaneuvered, the Supreme Allied Commander, Europe sees no option but to use nuclear weapons.

The above scenario may not appear in any NATO war game. But critics of preparedness contend that most, if not all, of that scene is highly possible, given many of the weapons that have been built for U.S. military personnel. To be sure, American know-how has put numerous good weapons in America's arsenal, and some are the best in the world. But the Pentagon, particularly in the past decade and a half of peacetime, has come to rely increasingly on high technology for defense. The trend is driven partly by the American ethic of wanting to fight wars with machinery to save the lives of men. It is encouraged by the brilliance of American scientists and the increasingly sophisticated aerospace industry. And it is reinforced by the so-called Iron Triangle of mutual interests shared by politicians, the defense industry and the Pentagon bureaucracy, all of whom benefit from big, expensive weapons programs.

The result, too often, has been weapons that stretch technology to its breaking point, taking more than a decade to design and build and costing tens of billions of dollars. Designed in the lab, modern weapons may be tested more on comput-



IDI

of the Pentagon's most notorious weapons. Fast but lightly armored, it may be an easy target for enemy antitank weapons

ers than in rigorous field situations or under mock battlefield conditions. And they are so expensive that they inevitably take money from training and from the stocks of materiel needed for a real war.

With the Reagan defense spend-up over and with major defense cuts under way, defense experts are increasingly asking what the U.S. has gotten for its money. Indeed, when *U.S. News* surveyed 25 weapons experts—including former infantrymen, admirals, generals and fighter pilots, as well as Pentagon analysts, congressmen and Armed Services Committee staffers—there was a broad consensus on the five to 10 "worst weapons" in the U.S. arsenal. They tended to agree on the best, too, but that list was shorter. Thus, while the bulk of America's military weapons may be equal to or better than anything else in the world, there is growing concern that high-priced bad weapons may be driving out the good ones.

Defense Secretary Richard Cheney already has proposed that some of these high-priced worst weapons be cut from the 1990 defense budget to meet spending caps. Clearly, even more will have to go as between $10 billion, and perhaps as much as $50 billion is slashed from each of the $300 billion defense budgets of the next five years. But members of Congress, lobbied heavily by military contractors in their districts, are likely to undo much of Cheney's brave work. Last week, the House Armed Services Committee voted to restore two weapons that Cheney cut. One is the V-22 Osprey, a vertical-takeoff transport for Marines that would cost $39 million for each of 663 airplanes. The other is a $30 million model of the Navy's F-14 fighter. Other superweapons that Cheney targeted, such as the F-15E fighter, may well be restored by summer's end.

Going outside for success

Cheney is in an interesting bind. While he feels compelled to seek a healthy defense budget and pursue new weaponry, the new era of relaxed Soviet-U.S. relations makes it harder to argue for hefty defense spending. Meanwhile, it will be years before significant changes are seen in the Soviet war machine. In Europe, the

Warsaw Pact has 53,000 tanks, compared with 22,000 for NATO forces. This strength reflects the Soviet military attitude that future battles will be short but intense, requiring huge numbers of relatively crude, cheap replacements.

Many of America's best weapons, such as the Sidewinder missile and the F-16A fighter, were innovative and would not exist without the Pentagon's technological commitment. But many of the best weapons have been designed and built largely "outside the system," by single-minded innovators with a clear vision of why the weapon was needed and how fighting men would use it. The most successful ones resisted being burdened by too many Pentagon specifications and high-tech add-ons from military-weapons labs. Early successes were the P-51 Mustang, developed by the British but resisted by the Army because its Rolls-Royce engine was built overseas, the jeep, and the 3½-inch antitank rocket launcher of the early 1950s, copied from the Germans. Recent examples include the Stinger antiaircraft missile, the C-130 and C-141 transports, the AR-15 automatic rifle and the A-10 Thunderbolt II tank-attack plane.

Yet sometimes it seems even the best weapons do not escape the Pentagon bureaucracy. The F-16A fighter is a case in point. It was designed in the early 1970s by two Air Force pilots and a Pentagon engineer who wanted to build a plane smaller, cheaper and better than existing fighters. They squirreled away some Air Force research funds and masked their project from military-procurement officials. Eventually built by General Dynamics, the first F-16s, the "A" models, were austere, agile, reliable and lethal. And they outperformed the large, multiweapon F-15 that was the darling of the Air Force. By 1975, the F-16 project found an advocate in then Secretary of Defense James Schlesinger, who believed that air wars would be won by the side that had large numbers of small but effective fighters, not large, expensive planes. Schlesinger told the Air Force that if it agreed to buy the new, cheap F-16s and A-10s, which were also being produced then, he would expand the Air Force by four air-combat units. The Air Force's chief agreed.

Word spread quickly that the F-16 was a fighter pilot's dream. But Air Force people quickly came up with new missions and high-tech gear for the little daytime fighter: They wanted it to fly at night, carry more armament and attack ground targets deep in enemy territory—missions that already were being undertaken by the larger, more sophisticated F-15. That required heavy air and ground radar, missile and bomb-guidance equipment and weighty structural additions. The F-16's takeoff weight rose from 23,500 to 29,000 pounds, and its combat maneuverability, acceleration and handling decreased. The plane that the Air Force hoped to build for $3 million each and eventually bought for about $10 million costs $18 million today. "They've totally wrecked the F-16. The current versions certainly aren't worth owning," says one industry engineer who worked on the program. Now the Air Force wants to get rid of its slow, effective antitank A-10 and turn the lightweight supersonic air-to-air F-16 into a tank killer. It would be renamed the A-16, and it would cost even more. Experts say, however, that pressures on the defense budget may well end the A-16 project.

PHOTOS BY GREG E. MATHIESON—MAI

High-tech. *The Hummer is the Army's new, modern jeep*

Old reliable. *The soldier's best friend?*

No way out

Not all expensive and questionable weapons, however, can be canceled with the stroke of a pen. For some already in service, like the M1 Abrams tank, there is no modern alternative. Built in the early 1980s as an easily operated, fast and heavily armed replacement for the aging M60, it was to be the most advanced tank in the world. But each one costs $2.5 million and is so complex it needs an extra maintenance team separate from the tank crew. The tank uses so much fuel that one tank division needs 600,000 gallons a day, twice as much as Patton's entire Third Army used when it raced across Europe—and Patton ran out of gas. Even if the M1 is deployed using tactics that don't require long marches, the Army acknowledges that its turbine engine, which uses 3 to 8 gallons a mile, will be hard to logistically support.

Current debates, however, focus more on the big-ticket items, such as the $70 billion B-2 Stealth bomber and the $50 billion planned for the Strategic Defense Initiative, known as Star Wars. That is because these programs are so expensive, and yet unproven, they are fat budget-trimming targets. Indeed, the real enemies of SDI are the three military services, which would rather see the Star Wars budget slashed than have funds cut for their own planes, ships, tanks and men.

The squeeze on the defense budget will surely continue in the next several months and years. And the battle among the services, and among congressmen trying to protect pet programs, will intensify. It has been suggested that the best way to cut the budget would be to create a presidential commission similar to the one that closed military bases. On the pages that follow, the 25 experts *U.S. News* consulted spell out their choices for the best and the worst in the Pentagon's arsenal. ■

by Peter Cary with Bruce B. Auster

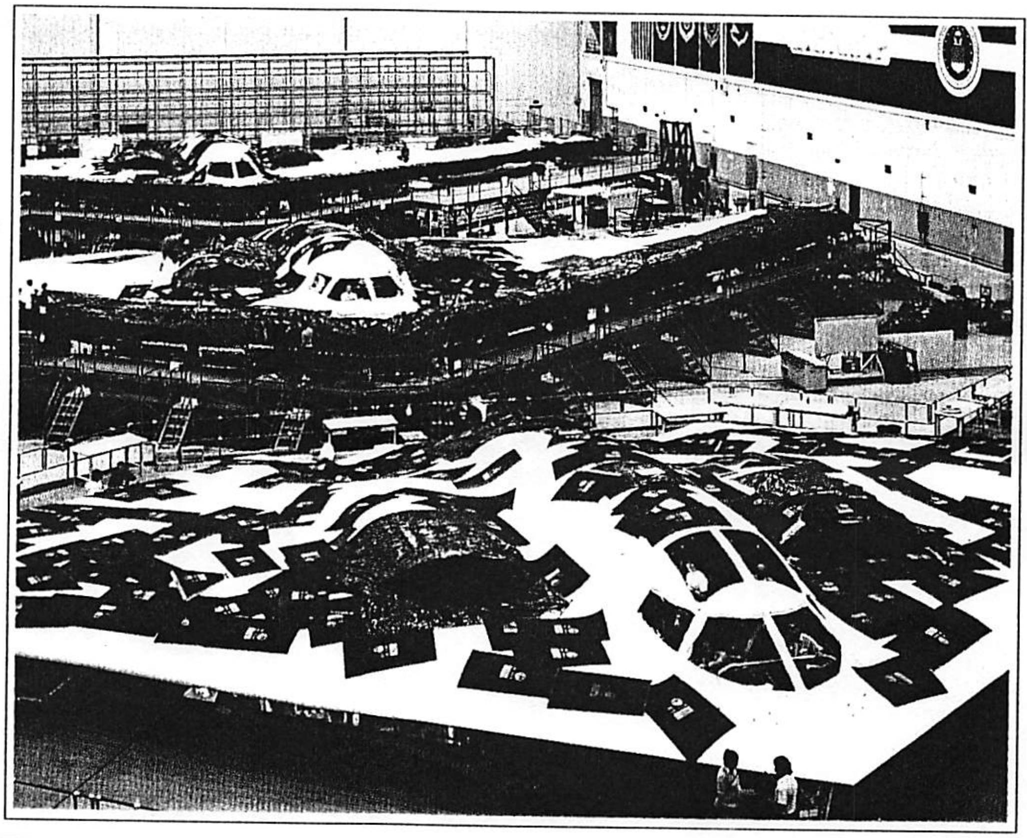
Experts surveyed: Project on Military Procurement; Center for Defense Information; C. E. Myers, defense consultant; Carl Bernard, antitank consultant; Pierre Sprey, fighter-aircraft designer; Lawrence Korb, former assistant secretary of defense; Gordon Adams, director, Defense Budget Project; Mike Burns, analyst, Business Executives for National Security; Richard Stubbing, former OMB defense chief; Col. Jim Burton, USAF (Ret.), former OSD weapons specialist; Thomas Amlie, Air Force technical-systems analyst; A. Ernest Fitzgerald, USAF management-systems deputy; Rear Adm. Rowland Freeman (Ret.), former Navy weapons-lab chief; Representatives John Spratt (D-S.C.) and John Rowland (R-Conn.); 10 other representatives, senators, aides and defense specialists

THE WORST WEAPONS

What makes a worst weapon? The 10 weapons cited here fall into several broad categories. Some appear to be technically unsound ideas, while others are technically feasible but will cost so much to develop and build that they drain funds from other, less-expensive but proven weapons programs. Some duplicate weapons already in existence, and some are built for missions that are strategically ill-conceived. Still others, critics say, unnecessarily endanger personnel.

B-2 BOMBER

Cost each: *$532 million*
Total program: *$70.2 billion for 132 airplanes*
Spent so far: *$22.5 billion on development and six planes*
Alternatives: *B-1B bombers, B-52s with cruise missiles*
Comment: *The flying-wing B-2 bomber will be the most expensive and controversial warplane ever built. The Air Force originally designed it to penetrate deep into Soviet airspace to take out mobile missiles after the outbreak of nuclear war. But critics say that it may be unstable in flight and detectable by Soviet radar and that its missile-finding systems may never be good enough. With $22.5 billion spent so far, the plane has yet to fly. The Pentagon now says it could do conventional bombing, too, a downgrading of its mission and a sign of the B-2's problems.*

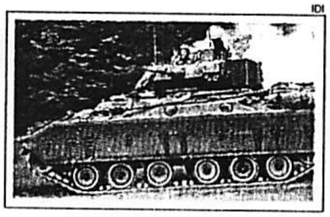

NORTHROP

MAVERICK

Cost: *$136,000 per missile*
Total program: *$3.2 billion for 23,529 missiles*
Spent so far: *$2.7 billion*
Alternatives: *A-10 airplane with its antitank cannon*
Comment: *The IIR (imaging infrared) Maverick was designed to let pilots destroy tanks from as far away as 20,000 feet. The first problem, however, is finding the tanks. The heat-seeking Maverick was supposed to solve the problem, but it may have problems distinguishing tanks from fires and hot pavement. Even the newest Maverick requires pilots to fly a straight and predictable course to lock on to the tank, exposing them to aircraft and groundfire. Some weapons analysts believe that the Maverick will kill more pilots than tanks.*

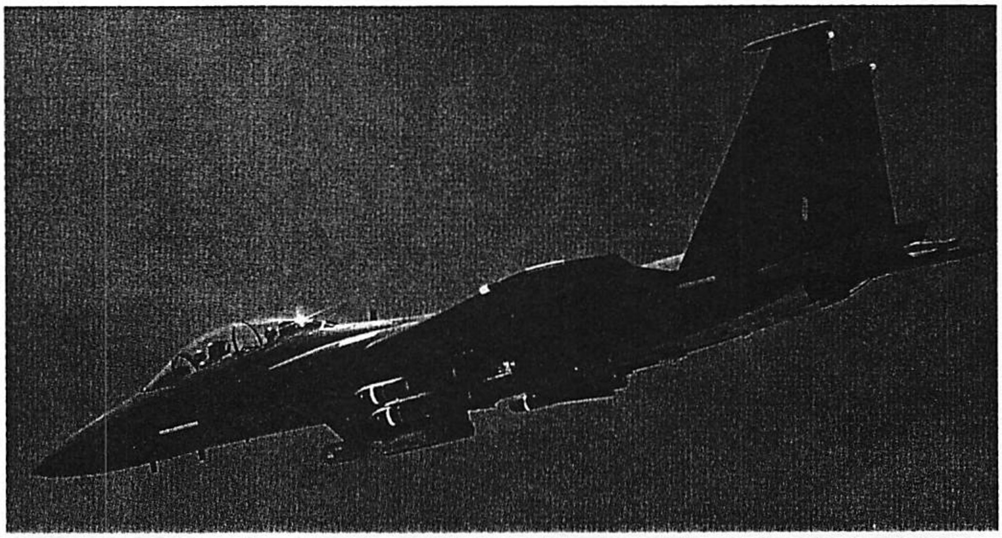
BRADLEY M2

Cost each: *$1.4 million*
Total program: *$12.1 billion for 8,485 vehicles*
Spent so far: *$8.4 billion*
Alternatives: *M113 armored personnel carriers or trucks*
Comment: *In the early 1960s, the Army decided it wanted an amphibious vehicle bristling with guns so its 12 men could fight from behind its armor. Twenty years later, the Army got the lightly armored 25-ton Bradley fighting vehicle that carried a crew of three but only six infantrymen inside. Taller than an M1 tank, it is a big target for antitank rounds, which could explode its ammo and fuel. The Army says tactics and speed will keep it from getting hit. But, the Israelis, the world's leading experts in tactical tank warfare, refuse to use the Bradley.*


IDI

F-15E

Cost each: *$42 million*
Total program costs: *$11.9 billion for 278 aircraft*
Spent so far: *$4.9 billion*
Alternatives: *F-16s, surface-to-surface weapons*
Comment: *The first F-15s deployed in 1974 were air-to-air fighters. Large, highly maneuverable missile and bomb carriers with a top speed of Mach 2.5, they were kings of the air. Exercises pitting them against mock Soviet MiG fighters showed F-15s to be the winners in one-on-one combat. But the Air Force gave them additional missions, loading them with guidance-and-bombing equipment so they could fly in all weather and perform low-level bombing deep in enemy territory—missions the Air Force embraces, while the Army's needs emphasize front-line attacks on the enemy. This forces the Army, which by agreement with the Air Force cannot own and operate fixed-wing planes, to build vulnerable attack helicopters for a mission better suited to jet airplanes. The latest model, the F-15E, carries the $4 billion LANTIRN guidance-and-target-seeking system. That will bring the cost per plane to $42 million each—high enough for Defense Secretary Richard Cheney to propose ending production after 1991.*



C-17

Cost each: *$177 million*
Total program costs: *$37.5 billion for 211 airplanes*
Spent so far: *$5.1 billion*
Alternatives: *More C-5s, commercial planes, sealift*
Comment: *The Air Force wants to buy 211 of these cargo-carrying behemoths to ferry its Rapid Deployment Force anywhere in the world. But the Air Force already has 50 C-5s, which cost $165 million each, and it could buy more. The C-17 is being touted for its capability to land on short, rough airstrips. But the first ones to be produced will cost $250 million each, and, at that price, who would want to risk a crash landing?*

ANTONY PLATT—BLUE THUNDER PICTURES

AEGIS

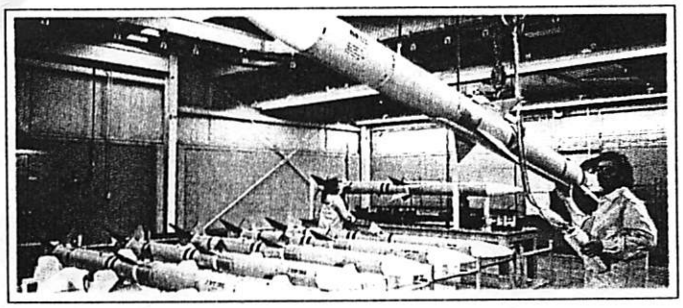
Cost each: *$850 million, half for Aegis tracking system*
Total program costs: *$24.1 billion for 27 CG-47 Aegis cruisers; $27.1 billion for 33 DDG-51 Aegis cruisers*
Spent so far: *$31.5 billion*
Alternatives: *Conventional radar, command and control*
Comment: *The Aegis command-and-control system processes radar signals and feeds them to an on-board command system that controls all the ship's weapons. The Navy says that the Aegis system could detect and shoot down hundreds of incoming aircraft and missiles and differentiate friend from foe. But the system's problems were demonstrated last July in the Persian Gulf, when an Aegis-equipped cruiser downed an Iranian airliner, believing it was a fighter. The mistake cost 290 people their lives.*

V-22 OSPREY

Cost each: *$39 million*
Total program cost: *$25.9 billion for 663 Ospreys*
Spent so far: *$2.4 billion*
Alternatives: *Transport helicopters*
Comment: *This tilt-rotor airplane being built for the Marines is supposed to take off like a helicopter, fly like a plane and land on a dime. Marine Corps commanders say they need Ospreys to ferry large numbers of Leathernecks "over the horizon" in staged assaults. The Osprey is designed to fly invading troops further inland than traditional helicopters, but that may leave Marines beyond the range of supportive naval gunfire and artillery.*

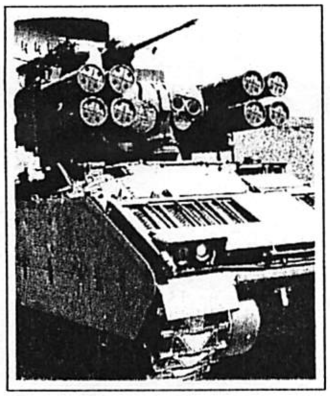
THE BEST WEAPONS

The qualities of a good weapon are readily agreed upon: It must be effective, reliable, easy to operate and maintain and inexpensive enough to purchase in large quantities. It should inspire confidence, answer a real wartime need and do the job better than what the enemy brings to battle. But putting those qualities together in one package is a difficult task. The U.S. arsenal has a number of weapons that meet the test. Here are some of the best.



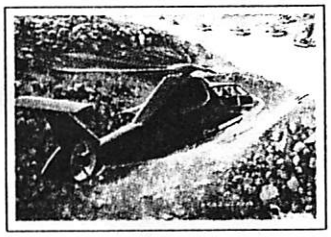
AMRAAM

Cost each: *$900,000 now, projected to cost $350,000*
Total program cost: *$11.2 billion for 24,000 missiles*
Spent so far: *$3.5 billion*
Alternatives: *Sidewinders, Sparrows, cannons*
Comment: *A medium-range air-to-air missile, the AMRAAM is designed to guide itself to radar targets far beyond visual range. If AMRAAM's were affordable and proven, they would be hailed as a revolutionary weapon. But they have not been tested in combat, and the ones built this year cost nearly $900,000 each, a price that has forced the Air Force to stop buying cheap and effective Sidewinders. AMRAAM will require that its out-of-sight radar targets be identified as enemies, but NATO radars have trouble telling friend from foe.*



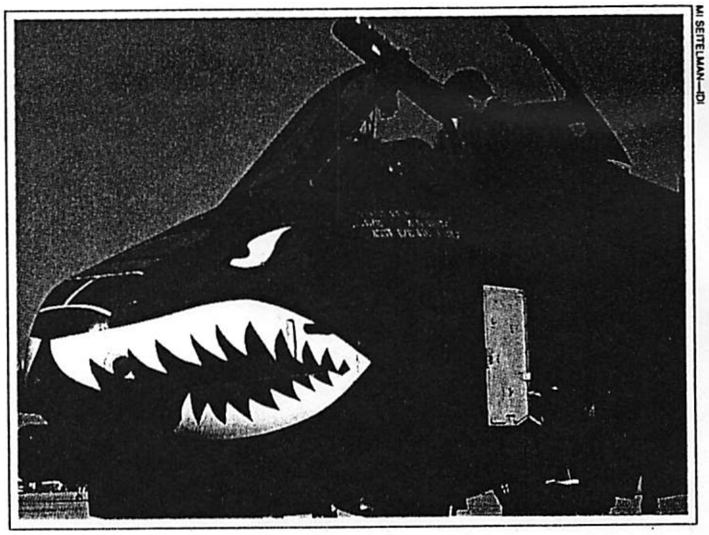
ADATS

Cost each: *$11 million*
Total program cost: *$6 billion for 566 weapons*
Spent so far: *$345 million*
Alternatives: *Pedestal-mounted Stinger, or a good antiaircraft gun*
Comment: *A successor to the failed DIVAD antiaircraft gun, this is the Army's choice for a front air-defense weapon until it develops something better. ADATS, however, will cost twice as much as DIVAD. Since ADATS tries to mate three different weapons on one turret, it may not work much better than DIVAD did.*



LHX

Cost each: *$20 million*
Total program cost: *$42.5 billion for 2,100 aircraft*
Spent so far: *$623 million, contractor not yet chosen*
Alternatives: *Other helicopters*
Comment: *This is the Army's cost equivalent of the B-2, a stealthy, lightweight, space-age superhelicopter costing as much as a fighter plane. The original concept was to make a single-seat helicopter for three missions—scout, attack and utility purposes—that would be cheap to buy and maintain. But the Army added so many mission requirements that the price soared. Says one expert: "The Army can field either the LHX or an Army, not both."*



MI SEITELMAN—IDI

A-10

Best antitank weapon
Cost: *Average $7.6 million*
Number bought: *707 planes*
Comment: *Ugly and slow, the A-10 tank killer simply gets the job done. That is mainly because of its cannon, a seven-barrel 30-mm Gatling gun that fires dense bullets of armor-piercing depleted uranium. Some aircraft designers say the A-10's biggest defect is that it was built too big, to carry extra bombs because the Air Force was unsure of its new cannon. The cannon turned out to be excellent, and the ammunition program was even better, with competition driving the price so low that the U.S. bought a million rounds. Armored with titanium to protect it from ground fire, the A-10 is supposed to be able to fly home if one engine is inoperable, or even shot off.*

HERMAN KOKOJAN—BLACK STAR

SIDEWINDER

Best missile

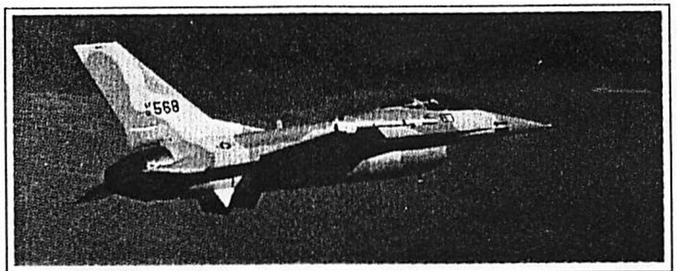
Cost: *$50,000 each*

Number bought: *About 195,000*

Comment: *The Sidewinder was the brainchild of William B. McLean, an iconoclastic Navy missile designer. Working from his California garage in the late 1940s and using pieces scrounged from scrapyards, McLean designed a missile that would home in on the hot exhaust of jet engines. He kept it secret from the procurement bureaucracy until it was ready to fly. Since it was first fielded in 1956 at a cost of $3,000 each, the missile has been steadily improved and copied worldwide. The latest version can attack an airplane from nearly all angles. The West Germans and Japanese have built 25,000 Sidewinders, while other countries have made 350,000 bootleg copies.*

F-16A

AP



Best fighter

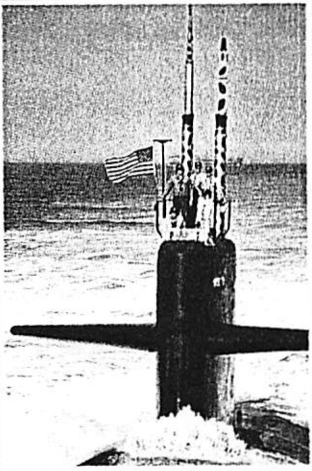
Cost: *$10.6 million each*

Number bought: *785 F-16A/B's*

Comment: *The cheap, reliable little F-16A was designed "outside the system" and used revolutionary airplane design to achieve its remarkable agility and range (about 2,400 miles). Built by General Dynamics, the F-16A is called by many experts the best fighter ever made. Armed with only a 20-mm rotary cannon and short-range Sidewinders, it depends on acceleration and maneuverability rather than heavy missile armament and super speed to win air battles. Many jet jocks contend that, even today, that's enough.*

SSN-688 SUB

MI SEITELMAN—IDI

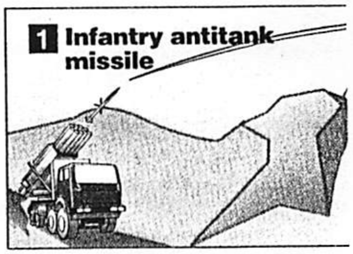


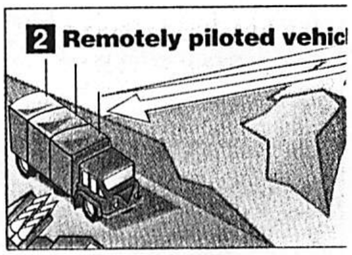
Best ship

Cost: *$346 million each*

Number bought: *39 so far*

Comment: *With its high underwater speed of 31 knots, the* Los Angeles *class of submarines was the first to be able to run escort for U.S. carrier battle groups. Previous models of nuclear submarines were slow to perform the missions associated with escort duty. SSN-688 and its sisters can carry 26 conventional and wire-guided torpedoes, plus Harpoon and Tomahawk cruise missiles, which are among the most effective weapons in the fleet. Quieter, faster, and deeper diving than its predecessor, the* Sturgeon-*class subs, the* Los Angeles *submarine is good enough to give submariners pause about plans for the latest Navy dream, the* Seawolf. *The* Seawolf, *at 35 knots, won't be that much faster and won't be able to dive much deeper—2,000 feet—than the* Los Angeles *subs. And the* Seawolfs *could cost up to $2 billion each.*





GOOD IDEAS THAT NEVER FLY

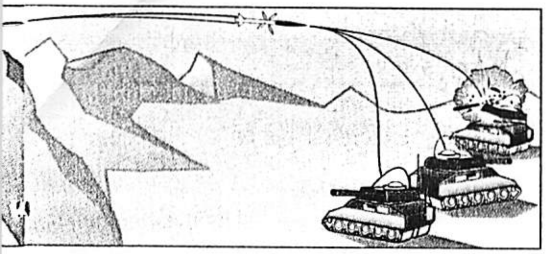
In budget wars, simple weapons lose out to planes and tanks

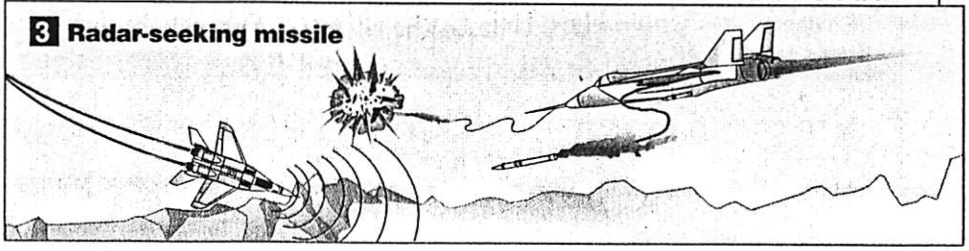
When Carl Bernard was a second lieutenant in Korea, he learned the hard way about the low priority the Army gave to antitank weapons. His rifle company fired round after round of bazooka rockets at the approaching North Korean armor, with no greater effect than "scratching the paint." Bernard and a sergeant finally set one tank on fire by climbing onto the turret and pouring a 5-gallon can of gasoline on its hot engine compartment. But 85 men in his company were killed in the battle, many as they fled in panic.

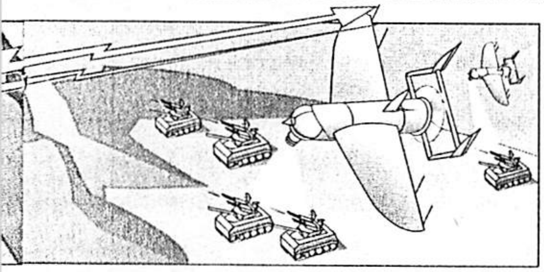
Thirty-nine years later, he is still fighting that battle. "We've never had any antitank weapons that work," says Bernard, who now runs a small defense consulting firm, ISAT, Inc., in Alexandria, Va. "These weapons are not a priority—big, glamorous things are priorities."

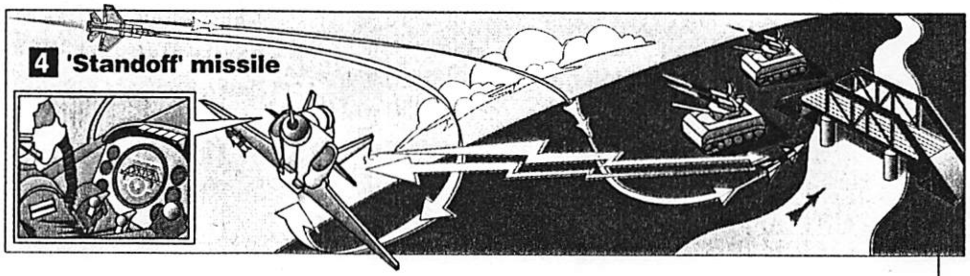
Bernard's frustration is widely shared. Military experts can point to many weapons, some quite simple, whose need has been obvious for years or in some cases decades, but that

DAVID S. MERRILL AND MATT ZANG—*USN&WR*









never make it through the byzantine Pentagon bureaucracy:

1 Infantry antitank missile. Stopping tanks has become an even more urgent mission today; the chief conventional threat facing NATO in Europe is the huge Soviet tank armies. The fundamental problem with current antitank missiles, however, is that they fly in a direct line from the infantryman gunner to their target. That means the gunner must stand up and expose himself on the battlefield, and that the missile is attacking the most heavily armored surface of the tank—the front.

Since the mid-1970s, several ideas have been developed for tank killers that allow the gunner to remain hidden and that strike the tank on its vulnerable top. One, the FOG-M, or fiber-optic guided missile, met stiff resistance for years from the Army bureaucracy. Developed by a physicist at the Army Missile Command, the FOG-M can be launched vertically from a concealed position; a TV camera in its nose relays a picture back to the gunner over a rapidly unspooling fiber-optic cable, and the gunner steers it into the target using a joystick.

The infantry, however, showed little interest in the idea, arguing that it was an artillery weapon. The artillerists were more interested in their own pet project, a laser-guided artillery shell. The tank establishment argued that the best way to kill Soviet tanks was to buy a bigger gun for the M1 tank. It took the direct intervention of Defense Secretary Caspar Weinberger in 1986 to finally order the development of FOG-M, though only as an antihelicopter weapon and in considerably smaller quantities than would be needed to effectively counter tank forces.

2 Remotely piloted vehicle. Israel has made extensive use of drones, or "remotely piloted vehicles," equipped with TV cameras to gather intelligence. In 1982, Israeli RPV's not much larger than model airplanes played a critical role in locating Syrian antiaircraft-missile batteries in Lebanon's Bekaa Valley; using the information, Israeli fighter planes were able to destroy the sites with the loss of only one aircraft.

The threat of increasingly sophisticated antiaircraft missiles and the need for up-to-date information about the fast-changing battlefield make a strong case for using unmanned planes to gather intelligence. In the U.S., however, efforts to build RPV's continue to founder. The Air Force has launched development programs on dozens of RPV's, but except for one series that was produced during the Vietnam War and later phased out, has never seen them through to completion. "The Air Force wants pilots to fly sorties through dangerous territory," says John Transue, former director for air warfare in the Office of the Secretary of Defense. "It's almost a cultural thing with them." The attitude is so familiar to defense analysts that they have a nickname for it: "The white-scarf syndrome." RPV's not only compete for funds the Air Force might prefer to spend on a new fighter or bomber; they compete directly for missions, such as reconnaissance and electronic warfare, that have traditionally been carried out by piloted aircraft.

The Army's efforts to develop an RPV, the Aquila, ran into a different Pentagon foible, the urge to add ever more requirements to a weapon as it is developed. The Army decided that its RPV should carry not only a TV camera but an infrared camera to take pictures at night and a laser that it would aim at ground targets to direct laser-guided artillery shells. After spending 15 years and $1 billion, the projected price of each drone had grown to a staggering $2 million. The Army canceled the program last year. The Navy meanwhile has purchased nine considerably less expensive Israeli RPV's. Israel Aircraft Industries, which has had drones on the market for a decade, is among the bidders for a new Army, Navy and Marine contract for a short-range RPV to replace the Aquila.

3 Radar-seeking missile. All the battle plans of the Air Force and Navy depend on extensive use of radar. Search radars carried on board fighters and cruisers sweep the sky in search of enemy planes; terrain-following radars allow bombers to hug the ground without crashing into hills; fire-control radars lock on to a target and steer missiles in for the kill.

The only trouble is that all those radars act like beacons, telling the enemy where we are. The Soviets have reportedly developed an air-to-air missile, the AA-10, that chases the radar signals given off by a fighter.

Although the U.S. has deployed similar radiation-seeking missiles for attacking radar-controlled antiaircraft batteries on the ground, the effort to build an air-to-air version never got past a demonstration in the mid-1970s. Critics say the reason is simple: Deploying such a missile would be an admission that our own, radar-laden, aircraft are sitting ducks.

4 "Standoff" missile. Current weapons carried by U.S. fighter-bombers require the planes to pass almost directly over their targets, exposing them to antiaircraft fire. For more than a decade, a series of programs has been launched to develop a "standoff" weapon that could be fired from 10 or more miles away and fly under radio control or guided by a built-in electronic seeker to attack tanks, bridges or command posts. All have been canceled. Transue contends that there is a double standard: When aircraft programs, like the B-2, run into technical obstacles, the Air Force finds the money to fix them. When weapons programs run into trouble, they're killed. "Time after time, standoff weapons are started, then stopped," he says. "But in the last 30 years, you can't find a single, solitary example of an aircraft we started out to develop that was not pushed to completion." ■

by Stephen Budiansky

From: U.S. NEWS & WORLD REPORT [APRIL 1, 1991 - p. 16]:

"Although top U.S. commanders last week estimated that Iraq suffered at least 100,000 military deaths during the war, other sources in the Gulf say that the final total — including civilian fatalities — will be at least twice that. These sources say that the Allied aerial attacks inflicted far more casualties than previously thought."

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NEWS RELEASE

GULF WAR GENERAL NAMED GRAND MARSHAL OF HOLLYWOOD'S WELCOME HOME DESERT STORM PARADE

HOLLYWOOD, April 26 -- Lieutenant General Calvin A.H. Waller, U.S. Army, who coordinated the ground campaign in Operation Desert Storm as Deputy Commander-in-Chief of U.S. Central Command in Riyadh, Saudi Arabia, will lead Hollywood's Welcome Home Desert Storm Parade, May 19, as Parade Grand Marshal.

"We're honored and delighted that General Waller has accepted our invitation," said Johnny Grant, producer and co-chairman with Los Angeles Mayor Tom Bradley of the welcome home celebration.

"As second in command of all deployed Persian Gulf forces and coordinator of the ground campaign plan, General Waller was instrumental in the ultimate success of Operation Desert Storm."

General Waller's distinguished Army career includes tours of duty in Korea and Vietnam. During the Vietnam War, he served as Joint Operations Officer for the Military Assistance Command-Vietnam. Following completion of his assignment in the Gulf on March 25, General Waller returned to Fort Lewis, Washington to resume his duties as Commanding General, Headquarters I Corps and Fort Lewis.

-more-

PAGE 2 LT. GENERAL WALLER NAMED PARADE GRAND MARSHAL

An estimated 6,000 returning Desert Storm troops, veterans from the Vietnam and Korean wars, celebrities and other participants will take part in the patriotic salute. The event will also feature military and school bands, floats, and an array of hardware representing a veritable history of America's arsenal of defense -- from a 1917 World War I Army Ambulance to the Gulf War's F-16 Fighting Falcon jet and Abrams tank. Plans also include parading unique vehicles, artillery and aircraft from World War II, Korea and Vietnam as well as the Gulf War. A spectacular flyover is planned that will feature examples of aircraft from fighter jets and helicopters to a Condor Squadron of WWII aircraft, a B-25 Billy Mitchell Bomber, the B-17 Flying Fortress, "Memphis Belle," and a flight of early Stearman open-cockpit bi-planes.

The massive parade, which will travel a 3.2 mile route along famed Sunset and Hollywood Boulevards, is being produced with the financial support of Universal Studios Hollywood, KTLA Inc., Kaufenberg Enterprises and Eastman Kodak. Bob Hope and Jimmy Stewart are honorary co-chairmen of the event presented by the City of Los Angeles and the Hollywood Chamber of Commerce.

#

Early Gulf War Lessons

VADM R. F. Dunn, USN (Ret.)

War in the Gulf: Day by day, a continuing, absorbing, real-life drama unfolds. Correspondents report live from Baghdad under attack and from cities on alert for Iraqi Scud surface-to-surface missiles. Videotapes from the cockpits of attacking aircraft are on television for all to see, and analysts and experts by the dozen trot out to offer their thoughts. The public gets saturated with fact, opinion, and data beyond what many can absorb and—to the dismay of some—the networks return to their situation-comedy shows. But the professional warrior and his colleagues continue to pay attention to the war. They must. They have to learn the essential lessons.

The first and most obvious lesson of the Gulf War to date is that technology works. In fact, Buck Rogers or Luke Skywalker would be at home in the Gulf War. Cruise missiles launched from ships far at sea destroy enemy air defense systems and other point targets. Iraqi ballistic missiles spread terror among the civilians in Israel and Saudi Arabia, although Patriot missiles intercept and destroy most of those ballistic missiles. Aegis-controlled missiles are on standby, should Iraqi weapons reach seaward. Missiles from fighter planes destroy other aircraft, and laser-guided weapons from tactical bombers pound heavily defended targets on the ground—the targets having been located with the aid of satellite-based navigation systems, television, infrared, and night-vision devices. Several types of missiles suppress and attack enemy radars. Meanwhile, other satellites gather intelligence, give warning, relay communications, and help commanders assess target damage. The money allocated to technology has been well-spent. The new gear works...over and over again.

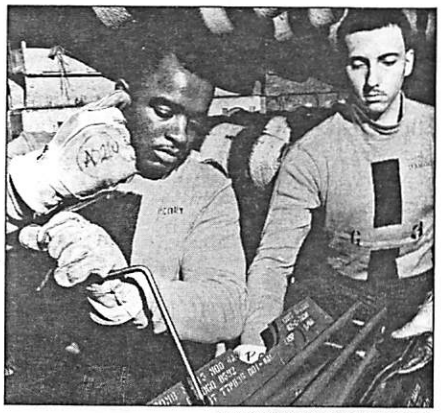
Yet despite all the technology—and because of it, as well—joint warfare and combined warfare work too. This is the early second lesson-learned. Seldom before has such a varied Coalition been cobbled together to face a common enemy. Despite differences in nationalities, cultures, languages, communications systems, weapons, and ways of doing things, the Coalition armies, navies, and air forces are working well together for one purpose: to curb and eliminate the aggressor. Joint and combined operations work in large measure because in peacetime the Navy has practiced with the Air Force, the Army, and most of the Coalition allies. These peacetime operations have laid the foundation for cooperation in war. It's well that they have, because everyone is needed.

Just as there is no such thing as a battlefield too crowded with allied forces, neither can there be a risk-free war. Some would believe that in an age of technology this might be so, but the early Gulf War results prove otherwise. This is the third lesson. In war, people get hurt, killed, and taken prisoner. Aircraft, ships, and other equipment will be damaged and destroyed. Ammunition will be used at rates unplanned for in peacetime, and some systems won't work as they're supposed to. Nor will the enemy always operate as we expect. He will strike back from unexpected directions with unexpected means in unexpected ways.

Only people—smart, well-trained, motivated, and well-led—can adapt and respond to such sudden shifts in the wind. Only such people can devise counters and take the prudent risks needed to beat the foe. The American forces—and most of those from the other members of the Coalition—have such people.

Lesson number four is that the money invested in recruiting smart young Americans into our armed forces, affording them the best training available, then paying them a decent wage, was also well-spent.

Lesson five is that return on the investment in naval forces in recent years also was a good one. A navy built around the principles of mobility, flexibility, and global reach is not only worthy of a great nation but is essential. That's what the U.S. Navy—once again—has proved to be. Navy aircraft carrier battle groups were the first U.S. forces on the scene when Saddam Hussein crossed into Kuwait and will probably be the last to leave when the war grinds down. Those carrier forces deterred Saddam from going farther; at the same time, they displayed American resolve to the Saudis, and probably played a key role in their granting permission for us to move in our land-based combat units. Even after the land-based forces fully deployed and the Coalition began the campaign to retake Kuwait, the special capabilities and strength of naval forces proved essential. Ships steaming in several areas created a multi-axis threat for Iraq. Tomahawk, SLAM (modified Harpoon land-attack missile), Phoenix, and the EA-6B provided capabilities not available in the land-based forces. Tailhook aircraft carrying HARM (high-speed anti-radar missile) and the A-6 Intruder augmented capabilities that were in short supply among the land-based forces. Beyond those things, the sheer numbers of carrier aircraft almost doubled the number of planes available to the Coalition for counter-air, strike, interdiction, and reconnaissance. Marines added their special talents, and SEALs and shipboard guns played as well. Meanwhile, naval forces tightened the noose of the blockade set months before. Once again, flexibility, readiness, and the indispensible role of the Navy to combat operations become apparent to all.



DEPARTMENT OF DEFENSE (C. W. MOORE)

Ordnancemen on board the *Kennedy*: ". . . the money invested in recruiting smart young Americans into our armed forces, affording them the best training, and paying them a decent wage was well spent."

At the same time, despite success in the air and on the sea, no credible observer claimed that the war could be won without a soldier or Marine, rifle in hand, claiming the ground. This was, perhaps, not a lesson learned, but a lesson underscored. As much as it might be wished otherwise, war still means mortal combat between armed warriors, often up close and personal. Infantrymen are still tasked "to close with and destroy the enemy." Brutal and dirty, yes; but that's the way it is.

Finally, it's still early to identify all the lessons from the Gulf War. These are offered to start the discussion. Time will tell how right—or wrong—they are.

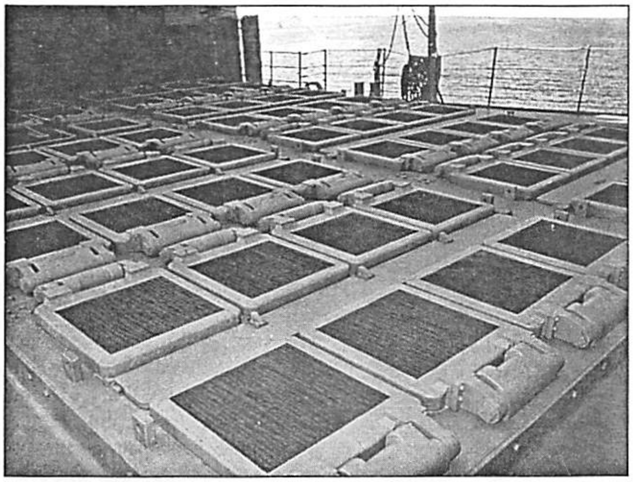
Admiral Dunn commanded the USS *Saratoga* (CV-60), Carrier Group Eight, and Naval Air Force, Atlantic. He was Assistant Chief of Naval Operations, Air Warfare (OP-05), when he retired in 1989.

The Last Great Air Battle

VADM J. Metcalf III, USN (Ret.)

It may be premature to declare that the initial stage of Operation Desert Storm was the last great air battle to be fought primarily by airplanes. Watching the war on television and marveling at the technological prowess of the newest in combat aircraft can lead to just the opposite conclusion. It is too easy to overlook the significance of the first U.S. cruise missile fired in anger and thus fail to realize that a revolution in warfighting is under way.

The revolution is a possible replacement for the manned bomber in future conflict. Why is man still aiming the weapons of war, like a spear-carrier in a Roman legion, when the technology to replace him clearly exists? The man-in-the-loop was powerfully demonstrated to the world by the Desert Storm's air commander, who with obvious pride narrated videotapes of laser-guided bombs going through windows and plunging through roof tops. The issue is—why is a man still required to bring his airplane to the target, risking his machine and himself, just to line up the sights?


GREG MATHIESON

The vertical launchers of the USS *Fife* (DD-991): "The first cruise missile that crashed into Baghdad arrived with all the stealth of its $100-million manned counterpart, the F-117 stealth fighter."

The first cruise missile that crashed into Baghdad arrived with all the stealth of its $100-million manned counterpart, the F-117 stealth fighter. Is there some technical obstacle to building a cruise missile that will fly through designated windows or boresight a roof? Actually, the cruise missile that can match the best manned system already exists or is on the drawing board. Many of the cruise missiles that flew to their targets in Desert Storm were superior to manned aircraft, judged by the criteria that count: hit the target; leave no downed friendlies behind to become prisoners.

In the matrix of missions flown against Iraq, relatively few cruise missiles were employed. Why? The direct answer is that only small numbers of conventionally armed cruise missiles were available. The real answer is much more complex.

Before Desert Storm the cruise missile was an orphan, weakly supported by the people who state requirements, the operational commanders. For the most part, it was a matter of confidence; war planners are unwilling to trust the outcome of future battles to the unknown and untested. These factors translated into low research-and-development and procurement budgets for cruise missiles.

There are good reasons to denigrate the cruise-missile systems of today. The Navy's Tomahawk is part of what—at best—can be termed an awkward warfighting system that has many perceived and real shortcomings. In the perceived category, the accuracy of the cruise missile is still questioned even though tests have demonstrated the missile's ability to make a field goal from 600-plus miles, hitting within yards of the target. The most significant shortfall in today's Tomahawk system is mission planning. It is awkward, overly complex, and unresponsive, and it cannot meet the battlefield's flexibility requirements. A cruise-missile mission can take months to plan if the requisite terrestrial mapping is not available. Even under best-case conditions, it may still require days. Neither a battlefield nor an afloat planning system exists. Current guidance systems can target only known, fixed locations. A search-and-destroy capability does not exist. Some consider the 1,000-pound warhead too small—even if it can thread a needle.

All of these warfighting shortfalls can and will be fixed. It is a matter of priority and attitude. The most formidable obstacles fall into the realm of change and mythology. Many who fly airplanes view the cruise missile as a threat. Navy carrier aviation proponents react like their great-uncles, the big-gun battleship advocates of the 1930s. In the Air Force, pilots do not see a need for cruise missiles because they believe they can do anything with a manned system that can be done with a missile. There was, is, and will be enormous resistance to change.

In the realm of mythology, the strongest opponents are Pentagon analysts who have decided that the cruise missile is very expensive. But—expensive compared to what? The Tomahawk is usually compared to an iron bomb; $2 million versus $55,000. The comparison excludes the launching platform—the airplane, its equally expensive support system, and people. The Navy or Air Force attack aircraft or bomber requires pilots and maintenance crews—people who must be paid, trained, and housed. Several thousand cruise missiles might require no more than a dozen technicians. Furthermore, cruise missiles do not require air bases with commissaries and government quarters.

The argument is often framed in an adversarial "us-against-them" relationship—the missile against the manned aircraft, rather than a systems comparison. The computer technocrat in air-conditioned splendor is matched against the white-scarf, stick-and-throttle community of warriors. The hard fact is that military judgment on weapons should be made on the basis of ordnance on target and targets destroyed, against the cost in dollars and lives. The mystique of Top Gun is great, but so was the romance of the horse cavalry.

The strength of the airplane is that it can deliver large amounts of ordnance. The strength of the missile is that it is precision ordnance, which can hit the target without risking prisoners or casualties. Enhancing either system to do the other's job is a waste of resources. Stated another way, spending money to automate the airplane to do the job of the cruise missile—in an era of reduced spending—means less ordnance on target.

Admiral Metcalf retired as Assistant Chief of Naval Operations for Surface Warfare (OP-03). He commanded U.S. forces during Operation Urgent Fury in Grenada.

Desert Storm

Rules of Engagement: No More Vietnams

COL W. H. Parks, USMCR

As U.S. forces deployed to Saudi Arabia in response to Iraq's invasion of Kuwait, anti-military groups in the United States began rallying to the cry "No more Vietnams!"

For once, they were right. Planning for and execution of Operation Desert Storm to date bear no resemblance to the U.S. experience in Vietnam, with one exception: enemy abuse of U.S. and allied prisoners of war. For rules of engagement, the contrast with Vietnam is significant.

The 1965–1968 Rolling Thunder bombing campaign against North Vietnam provides stark contrast to Desert Storm. In August 1964, responding to a request from Secretary of Defense Robert S. McNamara, the Joint Chiefs of Staff (JCS) developed a graduated program for aerial attack of military targets in North Vietnam. The JCS war plan was to sever the North Vietnamese lines of communication used for the import, export, and internal movement of war materials, while simultaneously establishing air superiority. The next step was to attack war-related industries and storage. To this end, the JCS identified 94 fixed targets requiring attack.

The heavy hand of the Secretary of Defense was present from the beginning. Based upon his direction, the JCS program for employment of air power was graduated geographically and in its intensity, to allow time for a little bombing, interrupted by frequent pauses to permit negotiation with the North Vietnamese to end the war—*if* the North Vietnamese chose to negotiate. (See "Flights of the Intruders," p. 32.) The plan also called for attack of targets outside of populated areas only, even though military targets may be attacked legally wherever they are located.

Secretary McNamara's purported concern was about collateral civilian casualties. The law of war concerning collateral civilian casualties follows common sense. The obligation is one of *discrimination,* which originated in the Just War tradition.

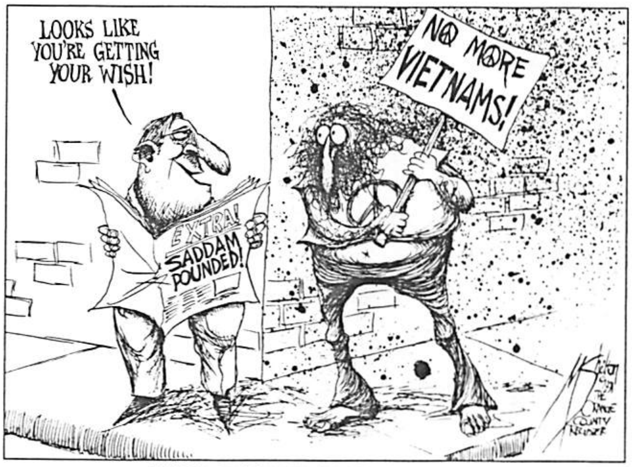
The obligation of distinguishing combatants and military objectives from civilians and civilian objects is a shared responsibility of the attacker, defender, and the civilian population as such. An attacker must exercise reasonable precaution to minimize incidental or collateral injury to the civilian population, consistent with mission accomplishment and allowable risk to the attacking force. A defender must exercise reasonable precaution to separate the civilian population and civilian objects from military objectives. Individual civilians must exercise reasonable precaution to remove themselves from the vicinity of military objectives or military operations.

The principal responsibility for protection of the civilian population rests with the party controlling the civilian population. In no case may a combatant force use individual civilians or the civilian population to shield a military objective from attack.

In contrast, Secretary McNamara assumed *all* responsibility for collateral civilian casualties in North Vietnam. For this reason, he emphasized attack of roads and bridges in unpopulated areas, essentially turning the operation into a highly restricted interdiction campaign. He directed the attack of targets in a manner that purportedly reduced the risk to the civilian population while increasing the risk to aircrews. He personally selected fixed targets for attack, in some cases selecting the aircraft, weapons loads, dates and times of strike, and routes of ingress to and egress from the target. Limitations were imposed upon weapons employment because of anticipated public criticism of particular weapons, even where those weapons could have achieved a greater degree of target destruction at less risk to aircrews and to civilians near the targets.

The North Vietnamese sensed a weakness: an overconcern by U.S. senior officials for collateral civilian casualties. They responded by moving military objectives—such as aircraft, antiaircraft guns, ground-control intercept radar, and military convoys—into or adjacent to populated areas, or placing them in or on sensitive, off-limits areas, such as atop the dikes and dams of the Red River Valley dam system, on the roofs of hospitals, and in and around the Haiphong cultural center. They increased the level of their propaganda campaign against the bombing campaign, alleging "indiscriminate" attack of civilians. The Secretary of Defense responded by increasing the restrictions on U.S. aircrews, while continuing to refuse to authorize attack of the most important targets.

One week into Desert Storm, on the other hand, President Bush emphasized that "Never again will our forces be sent out to do a job with one hand tied behind their back." Special trust and confidence have been returned to the battlefield commander, and that trust and confidence are reflected in the manner in which Desert Storm was planned and is being executed.


LOOKS LIKE YOU'RE GETTING YOUR WISH!
EXTRA! SADDAM POUNDED!
NO MORE VIETNAMS!

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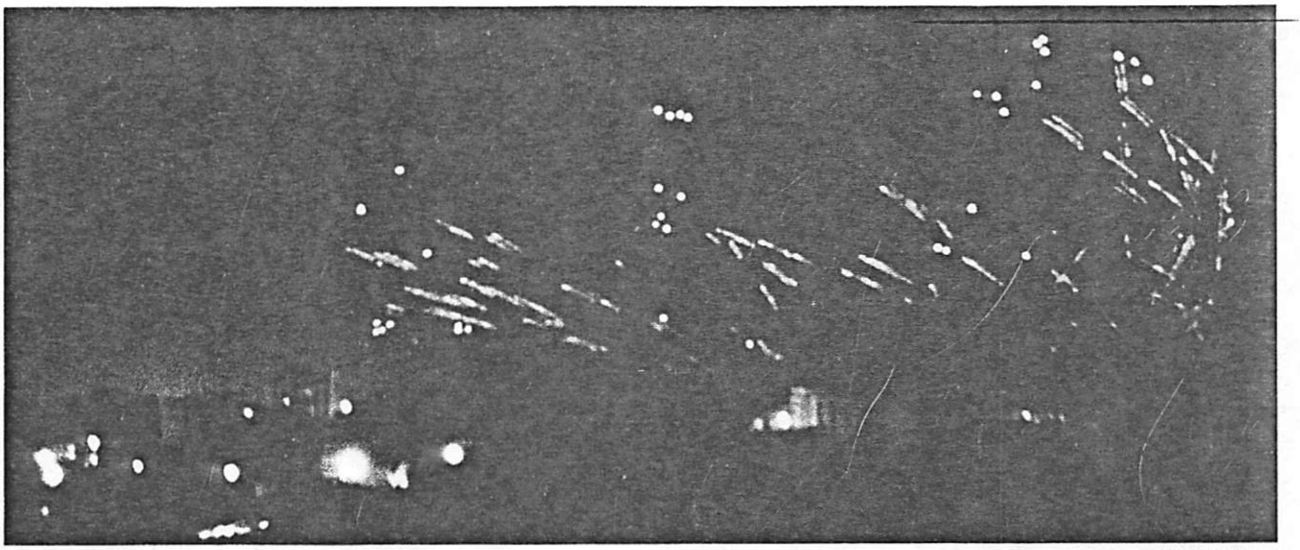
To be sure, other factors undoubtedly influenced this philosophy, not the least of which was the confidence shared by the national leadership, military planners, and aircrews in the ability of U.S. forces to wage a highly discriminate campaign. Notwithstanding marked increases in the complexity and lethality of enemy air defenses, technological advances have substantially improved target identification capabilities and bombing accuracy—to the point that the 500-foot CEP* of the average Vietnam-era strike aircraft for a daylight (only) attack has been reduced to less than 1% of that, day or night, with smart munitions. Stand-off weapons such as Tomahawk, Harpoon, and SLAM (modified Harpoon land-attack missile) can be employed against targets in high-threat areas to decrease the risk to aircrews. Highly professional, state-of-the-art training in integrated strike planning and execution at schools such as the Naval Strike Warfare Center and Marine Aviation Weapons Tactics Squadron One have enhanced aircrew confidence and capabilities. Quan-



PERIGNON-SIPA PRESS

Baghdad in the first hours of Desert Storm: "The principal responsibility for protection of the civilian population rests with the party controlling the civilian population."

tum leaps in computer technology greatly facilitate strike planning and force integration.

The change in philosophy regarding management of the air campaign is significant in its impact on the rules of engagement. That change apparently reflects in part the personal philosophy of President Bush, who steadfastly has declined to repeat the micromanagement practices of several of his predecessors.

The result is that responsibility and authority to plan and execute the military mission were returned to the theater commander, where they belong. Based upon national objectives and the mission assigned by the National Command Authority, U.S. Commander-in-Chief Central Command (USCinCCent) developed his war plan. Consonant with that war plan, USCinCCent prepared rules of engagement and the strategic target list. Each was approved by the JCS Chairman and the National Command Authority.

On commencement of Desert Shield, Saddam Hussein attempted to follow the practices of Ho Chi Minh and Libya's Moammar Gadhafi. In 1986, in anticipation of U.S. air strikes against terrorist-related targets in Libya, Gadhafi threatened to place U.S. and other foreign nationals around key targets to shield them from attack; subsequently, he did so in order to protect his Rabtah chemical weapons facility from attack.

This practice, prohibited by the law of war, was pursued by Saddam as he placed U.S. and foreign nationals around possible targets in an effort to shield them from attack. His ploy was unsuccessful; President Bush made it clear that the presence of hostages would not deter the U.S. from attacking any target, and that the United States would hold Iraq accountable for injury suffered by U.S. citizens as a result of their use by Iraq as human shields. Following international public outcry and several U.N. Security Council resolutions stating an intent to hold the Iraqi leadership responsible for its war crimes, U.S. and other foreign hostages were released by Iraq in December.

Saddam's threat to use U.S. and allied prisoners of war as human shields around high-value targets also takes a page from North Vietnamese practice. In May 1967, following a successful attack by U.S. Navy aircraft on the Hanoi thermal power plant, North Vietnamese officials constructed a new prisoner-of-war camp—nicknamed "Dirty Bird" by U.S. prisoners because of its filth—adjacent to the power plant to shield it from further attack, in violation of the 1949 Geneva Prisoner of War Convention. Using an earlier generation of the laser-guided bombs that now are plaguing Saddam, U.S. Air Force F-4 aircraft again disabled the power plant during Linebacker II operations, with no collateral injury or damage. The North Vietnamese action purposely was kept from the U.S. public by senior U.S. officials; if anything, Saddam's threat further galvanized U.S. public opinion in support of his defeat and trial as a war criminal.

The USCinCCent rules of engagement nonetheless reflect the traditional concern of U.S. forces for avoidance of incidental injury to innocent civilians. Missions are planned with the admonition to take reasonable measures to minimize collateral civilian casualties, consistent with mission accomplishment and allowable risk to U.S. and allied forces. Measures to minimize collateral damage to civilian objects are not to include steps that would place U.S. and allied lives at greater or unnecessary risk. Based upon data from the *Joint Munitions Effectiveness Manual,* rather than the whims and fears of Washington politicians, mission planners determine the appropriate munitions and delivery parameters for each target. Maximum suppression of enemy air defenses, to include electronic warfare, is integrated into strike plans to allow minimum distraction of strike crews from their goal of putting bombs on target. Targets in populated areas can be attacked, but aircrews are not to bomb if there is uncertainty in target identification.

Unlike Rolling Thunder, Desert Storm began with a bang, not a whimper. The public warnings by JCS Chairman General Colin L. Powell in the months preceding the 15 January deadline for U.N.-mandated Iraqi withdrawal from Kuwait, that there would be no Rolling Thunder-like "gradualism" in any alliance attack, rang true at 0300 Baghdad time on 17 January. The success of Desert Storm has been reported to the American public, frequently accompanied by videotapes providing vivid examples of the accuracy of U.S. air strikes. The discriminate U.S. campaign stands in stark contrast to the indiscriminate employment of Scud missiles against Israel and Saudi Arabia by Iraq.

Saddam Hussein would do well to read President Bush's lips: No more Vietnams.

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*CEP stands for circular error probable, which is the radius of a circle within which half of an aircraft's or missile's munitions are expected to fall.

Colonel Parks is Chief of International Law in the Office of the Judge Advocate General of the Army, where he has been involved in writing rules of engagement for more than a decade.

Desert Storm

POWs: Silence Is Not Golden

VADM J. Stockdale, USN (Ret.)

Iraqi captors in the Gulf War are forcing downed aviators to regurgitate the same kind of simplistic Third-World dictatorship "peace-speak" formulations that North Vietnam's political commissar wrote out for us in preparation for our first showdowns with "the ropes." His speech to the guy who was still trying to recover from ejecting into a 650-knot windstream from a tumbling jet would go something like this:

> "We are a peace-loving people, known for our humane and lenient treatment of our captured invaders. You are a criminal caught red-handed murdering our people. You must repent, bear deep shame, and atone for your crimes by speaking out truthfully about your complicity in this inhumane bombardment, condemning the aggression of your country, and begging the forgiveness of the peace-loving Vietnamese people."

At that point, the interrogation would begin. It would probably start with questions about missions, plans, future targets, then stop when the shattered pilot would refuse to go beyond name, rank, serial number, and date of birth. A nod from the interrogator to the torture guards—standing by with leg lugs, a heavy iron bar, and coils of Manila hemp rope—would trigger a smash to the pilot's face (soft fist, probably, to avoid marks). The guards would then wrestle him to the cement floor, lock his legs to the bar, and apply the ropes, binding his arms behind and cinching incessantly as the blood circulation stopped and pain became excruciating. The lead torture guard would add the filip of claustrophobia by jackknifing the prisoner, standing on his back, jerking the rope ends up vertically to ever-tightening strangulation, while he pushed the heel of his foot against the American's head and forced it down between his feet. In this position, he writhed in suspension, choking for breath until he submitted.

This may have taken 20 to 40 minutes, maybe an hour, but at the point of submission the American was brought to his feet for the real recorded "PR" interrogation. What I'm saying is that the interrogations of the POWs in Iraq that I've read about thus far convince me that they had been preceded by a routine similar to this.

The question is: What do we do about it? My answer is: Just know what's probably going on and use it as a political weapon against the Iraqi government. That stems from my conviction that, though Geneva Convention standards of conduct for captive powers should apply universally, until some kind of punitive action is taken against the leadership of violating countries—which will be possible only after we win and win big against one of them in war—their behavior is a sort of built-in condition of life for captive air crewmen everywhere. This development in the last 40 years came about, to some extent, through the growth of ideologies, but particularly by the worldwide communication explosion. Although I think Third World dictators generate such tortured statements mainly for internal use in building up contempt for their enemies among their own people, the temptation to introduce visions of downcast and stammering American warriors into the overseas media mix is apparently also overwhelming.

The United States might be tempted to take one form of action that I fear. As a junior officer I first read a description of this remedy in an article written by its originator, a bright active-duty Navy flag officer I knew and admired. He was so incensed to read the same sort of tortured statements as they poured out of the Korean War that he decided something had to be done. Why not, he asked, finesse the whole problem of painful resistance behind bars by announcing to the world that U.S. servicemen had been officially ordered by their government to agree to go along with any statement the captors proposed, without resistance. This would theoretically reduce the propaganda value of prisoners' statements to zero, and allow prisoners to live decent lives.

As a pilot in the late 1950s, I admit I thought my old friend had a pretty good idea. But after prison life in Vietnam, I realized that his idea would have been the world's worst solution. Prisoners of war grow to live on honor and self-respect. Their reputation is one of the few things they have left in their world, and they value it as they would a life ring in a raging sea. Though they might have thought the "big finesse" idea was a good one the day they got shot down, after months or years behind bars, they would have hated themselves and their government for encouraging them to spew all that rot on the airways free of charge. They would have known by then what all prisoners come to know: compliance extracted by brute force is in no way as spiritually damaging as that given away on a mere threat. And they would have learned from experience that in the end, their battle is a spiritual one, that the leak in the dike always starts from within, that once you throw down your barriers, the probing never stops.

ASSOCIATED PRESS

Prisoner of war Navy Lieutenant Jeffrey N. Zaun: "Iraqi captors in the Gulf War are forcing downed aviators to regurgitate the same kind of simplistic Third-World dictatorship 'peace-speak' formulations that North Vietnam's political commissioner wrote out for us in preparation for our first showdowns with 'the ropes.'"

I learned that at least half of the U.S. prisoners of war in Vietnam would have junked any prior orders to comply with the enemy as soon as they got a load of what it was like behind bars. Ordering the prisoners to back off on their sense of honor would have been unthinkable. As a government is powerless to legislate morality, so also is it powerless to legislate degradation. That half who refused to obey the order would despise the half who did. The prison organization would become a snake pit; discipline and morale would go down the tubes.

Many worse things confront a prisoner of war than a torture system. Americans have shown that they can learn to live with that—and with honor. We brought no psychotics home from Hanoi; that may have been our greatest achievement.

If I seem tough on prisoners in rejecting the big finesse, I also may seem tough on what I now say to American prisoner-kibitzers: Quit giving centerpiece status to that "name, rank, serial

> **"To hell with this passive resistance. You've got to fight with your brains, with lies, with disinformation, with guile, with trickery."**

number'' sentence in the Code of Conduct. The centerpiece of the code is the establishment of an American military command structure behind bars. The name, rank, and serial number line is damned good advice for initial interrogations, but eventually it becomes a false issue. It was written into the code as a tactical detail and has been misinterpreted ever since.

In spring 1973 I met General S. L. A. Marshall, the distinguished journalist and author. With a twinkle in his eye, he said, ''How did you get along with that 'name, rank, serial number' rigamarole in Hanoi?'' I said it was out of the question to hold to it during the four-year torture regime. I added that, sadly, some prisoners let it become a source of guilt.

''I was afraid of that,'' he said. ''You know, I was the wordsmith of that Code of Conduct. I lifted that sentence about being bound to give only name, rank, and serial number from the International Law prose describing what prisoners were *obliged* to give their captors. That was all the sentence meant, that they *had* to give their name, rank, service number, and date of birth. I never considered the fact that that formal 19th century prose might be misinterpreted. The last thing I wanted to do was send soldiers into prison constrained to what I call 'the wooden Indian' approach: 'Me no talkum.' ''

In my case, crippled, weak, hounded because I was senior, I had no thought of silence as ~~virtue. I started saying to myself:~~ ''You've got to get on your feet and fight. To hell with this passive resistance. You've got to fight with your brains, with lies, with disinformation, with guile, with trickery.'' Once hammered to write a history of the United States, I wrote several pages on the history of the Korean War—all bogus. The main point I invented was how U.S. public opinion was slow to grasp the idea of fighting a United Nations war until news started trickling in about the brainwashing of our own boys. American indifference vanished immediately.

I always smiled to myself when soon thereafter interrogators started telling prisoners: ''The Vietnamese people do not try to brainwash you, we never do that . . . we just try to explain. . . .'' This is just a lame example of some of the hoaxes Americans cagier than I pulled off to the delight of us all. What would we have been like after eight years of wooden Indianship?

In the last analysis, prisoner rules in any war are best made by those in the lockup, on the spot. That is what our Code of Conduct says: The senior prisoners will take command. When I was in the barrel, I used the Code of Conduct as a sort of Constitution, writing specific laws to fit the situation as I saw fit. The best thing we had going for us was being on our own, having no communication with the Pentagon, and thus the freedom to focus on what our ideals, those of us inside, called for. I think we chose some good ones, and I'm confident that those who follow in our footsteps in Iraq will do the same.

Vice Admiral Stockdale served two combat tours in Vietnam before his fighter was shot down in 1965. In nearly eight years of captivity in North Vietnam he spent four years in solitary confinement and ''took the ropes'' 15 times.

Interview

Vice Admiral W. Lawrence, U.S. Navy (Retired)

Based on his nearly six-year imprisonment in North Vietnam, Admiral Lawrence recently assessed the situation facing U.S. POWs in Iraq for *Proceedings* editor Fred L. Schultz.

Admiral Lawrence: I would like to make a preliminary statement on the POW issue.

Proceedings: Be my guest.

Admiral Lawrence: Wars today have a stronger propaganda element than any in history. That's been a key aspect of war since World War II. And it seems inevitable that prisoners of war become pawns in the propaganda battle. When you're fighting a totalitarian nation such as Iraq, which does not conform to the traditional rules of warfare, you know its leaders are going to use every device at their disposal to advance their cause, particularly from a propaganda perspective. The same occurred in the Vietnam War. We are fighting a nation in a desperate situation, in which its main goal is to arouse the sympathy of the Moslem masses around the world and cause nations such as Egypt, Syria, and Saudi Arabia to withdraw their support from the Allied Coalition. By broadcasting statements from POWs that are critical of their respective countries, the Iraqis hope to achieve this goal.

Proceedings: How did seeing the POWs on TV affect you? What were your reactions?

Admiral Lawrence: It brought back painful memories of my own POW experience in Vietnam. Somehow, I had hoped that the Iraqis were a bit more sophisticated and advanced, perhaps, than the North Vietnamese. But I realize that they aren't, that they're fundamentally the same.

Proceedings: What can you tell us that only a former POW could tell us? What are those guys really going through?

Admiral Lawrence: They're sturdy individuals. They wouldn't be in this profession if they didn't have the right stuff, and they've gone through the survival training. So, I am confident that they will endure their captivity well. I think most people in the world know that their public statements were obtained under coercion. So it shouldn't reflect adversely on the men being held. I'm sure they gave their best effort to resist, but they've been told not to disable themselves permanently or to lose their rationality by trying to resist making some absurd propaganda statement.

Proceedings: How do you feel about the requirement of the POW Code of Conduct to give only name, rank, serial number, and date of birth?

Admiral Lawrence: I think it's proper in that it conforms to the Geneva Convention on the Treatment of POWs, which clearly states that it be the only information required of a prisoner of war. But some nations won't abide by that provision.

It's important that POWs resist giving military information and making propaganda statements, short of destroying their health. By resisting, a POW establishes a credibility with his captors that he's not an easy mark, and they'll be less prone to come back again to exploit him for something else. They want to keep POWs alive and reasonably healthy because of their hostage value, and the leverage it'll provide them in future negotiations. They don't want to kill POWs.

Proceedings: We've heard from several former POWs that one of their foremost comforts was knowing that they had comrades in the same situation. Now that Saddam has stated that he will place each of his prisoners at separate strategic spots as shields, what effect would that have on individual POWs?

Admiral Lawrence: It would certainly make it more difficult, particularly now, since there are relatively few POWs. I think it's inevitable that they're going to be held. And they'll just have to get through it the best they can. Many of us in North Vietnam spent long periods of time in solitary confinement, and we got through it.

> **"It seems inevitable that prisoners of war become pawns in the propaganda battle. . . . We are fighting a nation in a desperate situation. . . ."**

Proceedings: What do the armed services do to prepare personnel for the possibility of being a prisoner?

Admiral Lawrence: They get very intensive training on the Code of Conduct, which governs the behavior of a prisoner of war. But the training also includes preparation for how to handle physical abuse. They get an introduction to what physical abuse and deprivation are like and taught about the techniques of dealing with interrogation, manipulation, and coercion. One thing that was instituted as a result of our North Vietnam experience was being prepared to use a cover story or fallback position. When they put so much pressure on you, you can no longer simply conform to name, rank, serial number, and date of birth. We have instructed potential POWs that they must be prepared to talk skillfully and deal with the captors by the use of clever deception.

Proceedings: In overall treatment, are the Iraqis much different from the Vietnamese?

Admiral Lawrence: It appears to me that they're fundamentally the same. I know that the Red Cross was critical of the Iraqi treatment of Iranian POWs. There were indications of cruel treatment and propaganda exploitation. I think it would be very similar to what we experienced in North Vietnam.

Proceedings: What advice—personal, gut-level advice—would you offer to someone who may be facing being captured?

Admiral Lawrence: Number one would be to take your survival, evasion, resistance, and escape training seriously. That training is realistic and very helpful. Of course, it's impossible to recreate the actual POW environment, but it gives a good appreciation of what captivity is like.

Number two would be to do your absolute best to maintain physical fitness and good health. In a POW situation, where your diet is restricted and you're experiencing deprivation and poor sanitation, being in the best physical condition possible will enhance your ability to function effectively and endure prolonged captivity.

The third thing, of course, is to have faith in yourself, your fellow POWs, your country, and your family. Know that your president will do everything possible to gain your release. A strong degree of faith maintains your morale and keeps you going. Those are the three major areas that I would address.

Proceedings: What should the United States do about the current situation now?

Admiral Lawrence: As President Bush announced from the very beginning during the hostage crisis over there—and now with the POWs—he simply cannot allow their presence to influence the conduct of the war. I agree. It may appear uncaring or callous, but it is the only practical course. But we should start taking actions now to minimize the advantage that they might have in holding POWs because of our high regard for human life in this country, and our open society. For example, we simply couldn't tolerate not having our POWs returned. On the other hand, a totalitarian nation such as Iraq would probably have no problem with simply writing off their POWs. First, we should seek a formal resolution out of the United Nations condemning Iraq for not conforming to the Geneva Convention on the treatment of POWs and, obviously, for coercing POWs to make propaganda statements. Such a resolution will help in applying the pressure of world opinion upon Iraq.

I think we also should work through the United Nations to change the Geneva Convention on the Treatment of POWs to include a specific provision that labels any public statement from a POW automatically as having been obtained through coercion. And it should reflect adversely on the holding nation as a violation of the Geneva Convention. The Convention now says that POWs will not be used for propaganda purposes. Such a provision would emphasize the point.

To reduce Iraqi leverage in negotiations to end the war because they hold U.S. POWs, we should seek to capture as many Iraqis as possible. In addition to providing POW lists to the International Red Cross, the United Nations, and the Iraqi government, we should broadcast POW names by radio and drop leaflets in Iraq. This would all be designed to keep their people informed, and to incite them to apply pressure on their government to release U.S. POWs in exchange. I think these are all measures that would help the situation faced by our POWs.

Proceedings: Do you think the Iraqis should be tried for war crimes when this is all over?

Admiral Lawrence: Unquestionably, they should. And I think that either through U.N. resolutions or other means, it should be clearly conveyed to the leaders of Iraq that they have violated international law, and they will be subject to trial under a war crimes tribunal. Not only have they mistreated POWs, they have invaded Kuwait, committed heinous atrocities there and released massive amounts of oil into the Persian Gulf, which is going to have an extremely adverse impact on the environment. The leadership in Iraq can't all be like Saddam Hussein. Their foreign minister, ambassador to the United Nations, and other leaders are educated, intelligent men. And I think when they realize that someday when this is all over, they're going to be subject to trial for war crimes, and they will reflect upon whether or not they should continue to blindly support Saddam Hussein. I think we should encourage discussion in the United Nations about Iraqi war crimes, as a means of reducing support for Saddam Hussein and, perhaps even effecting his overthrow.

> **". . . Have faith in yourself, your fellow POWs, your country, and your family. Know that your president will do everything possible to gain your release. A strong degree of faith maintains your morale and keeps you going."**

Desert Storm

Flights of the Intruders

RADM J. D. Taylor, USN

On the night of 16 January, when the final scene of Stephen Coonts's Vietnam flying story ''Flight of the Intruder'' faded into the credits, at the preview showing in Washington's Smithsonian Air and Space Museum theater, applause was sparse. The large, all-star, and mostly all-Navy audience of several hundred had certainly enjoyed the film, but the overwhelming and simultaneous commencement of the war with Iraq that night precluded the sort of involvement in the film that usually attends the opening of a major movie.

Having just heard the news of our first air strikes on Iraq as we entered the theater, few, if any, of us failed to link the silver-screen carriers, Intruders, warriors, surface-to-air missiles, flak, and the power projection practiced by Presidents Lyndon Johnson and Richard Nixon as national policy, with the real-world activities of the brave men on the *Saratoga, Kennedy,* and *America,* and in due course, the *Midway, Roosevelt,* and *Ranger*. This incredible coincidence presented a sort of time warp that defied the best human efforts to concentrate on the movie, despite the stark realism produced by Paramount.

In fact, that was the trouble for many of us. No memory comes back faster than indelible, personal brushes with death. The Smithsonian audience was literally overwhelmed. A vivid portrayal of the past demanded we go back to Vietnam, while the center of all current thought focused on the Gulf War. The Coonts Intruder story seemed incidental. It was a case of an undemonstrative audience suffering discombobulation.

A-6 Intruder on board *Midway* in the Gulf

But it was, nonetheless, a great movie, and a good one to see for a better understanding of the air war in Iraq. Paramount Pictures, Director John Milius, and all concerned have produced the next-best-thing to being there. The combat scenes are superb, and for the television-watcher who saw the CNN rooftop coverage of Iraqi antiaircraft fire during the first week of the war, this picture allows an opportunity to see what it looks like to the airmen on the receiving end.

When the movie opened across the country two nights later, crowds were small and the producers disappointed. But no way could a movie compete with the drama of war as never before reported to the homefront. The maxiseries, under titles such as ''War in the Gulf'' and ''America at War,'' put ''Flight of the Intruder'' on the back burner. And this was too bad. For if ever a movie depicted what strike warfare—mud moving—and modern night attack is all about, and how men cope under fire in the unique environment of a jet cockpit, this is the one. ''Flight of the Intruder'' provides insights into combat that extraordinarily complement the coverage of war that the satellites and cables bring into our homes and lives. The lessons of the past can be fused with the present. In fact, you go ''back to the present'' when you watch ''Intruder.''

For those of us who ''went downtown'' to Hanoi and the heartland of North Vietnam and dodged around between the streams of tracers 20 to 25 years ago, the movie and maxiseries look remarkably alike. We identify with Lieutenant ''Cool Hand'' Jake Grafton as he dodges missiles and looks down the barrels of the enemy's guns to take out targets picked by others who never leave the comfort of the normal, noncombatant life.

In Vietnam, those people did a lousy job of picking targets, which is what ''Flight of the Intruder'' is all about. ''Those people'' did something else wrong in Vietnam that made life more difficult and death more likely for attack pilots and navigator-bombardiers; they interspersed ''bombing pauses'' into the effort. Ostensibly, this was to give Ho Chi Minh and the boys on the other side a chance to talk peace. Of course, what Ho did during those pauses was to reload the missile launchers and reposition 37-, 57- and 87-mm. ammunition where it would be needed to keep life exciting for Intruder, Skyhawk, Phantom, Crusader, and Corsair warriors, among others. The pauses always came at about the time we had run the opposition down to minimal resistance, and we were able to spend more time finding and killing the mostly useless targets ordained in Washington. After the pauses, the flak and surface-to-air missiles were always thick, our casualties increased, and our sense of humor was more stoutly tested. (See ''Rules of Engagement: No More Vietnams, pp. 27–28.)

Like Grafton, we learned to survive the demands of the profession by cultivating a protective cocoon around our true feelings and fears. We developed an attitude of invincibility that took on a cavalier appearance to cope with the unavoidable mortal combat that lay ahead every day for months, even years, on end. So, just as Grafton and the actors in ''Intruder,'' and the real warriors now, we would ''flee forward'' to do our duty.

The beautiful thing about attack aircraft is that they fly only forward. Of course, you couldn't come home with your bombs, and if you didn't hit the target, somebody else, or you, would have to hit it the next day when an enraged enemy would be waiting for you. So we fled forward to get the thing done right so we could flee home to rearm. That's the way attack pilots deal with fear—incessant, never-ending fear that is submerged by bravado, determination, and self-confidence. If you know what you're looking for, this is what you see in ''Flight of the Intruder,'' and would see, if you could, in the lives of the warriors who are ''going downtown'' and to other exciting places in Iraq and Kuwait.

For those of us who have experienced the incomparable thrill of dancing and avoiding the tag of gently arcing streams of tracer ammunition to deliver our own killing fire, ''Flight of the Intruder'' is a come-alive experience. It's no wonder we didn't applaud.

A new generation of attack warriors is now ''fleeing forward'' to do their duty in the most historic deserts of the world and doing what they do best—making history.

Admiral Taylor is Director, Aviation Plans and Requirements (OP-50), Office of the CNO. He commanded Light Attack Wing (U.S. Pacific Fleet), USS *Coral Sea* (CV-43), USS *Kalamazoo* (AOR-6), Attack Carrier Air Wing Three, and Attack Squadron 46.

Interview

Greg E. Mathieson

During a short homecoming from the Persian Gulf, the world-class photographer shared his media pool experiences with *Proceedings* editor Fred L. Schultz.

Proceedings: How was your recent assignment to the Persian Gulf different from previous assignments?

Mathieson: The big difference is the sand; it gets into everything. There are no rocks that we could find. It's like walking in snow. The sand is a different color, from white to an almost golden color—the darker the color, the softer the sand. When you get out there in the darker stuff, it's like running in talcum powder. Your feet sink in as you're trying to walk. It's great for photographers who want to drop to their knees to take pictures, though. It's like falling onto a mattress. But once you spend a good solid day in the desert, you're burnt out.

One other different aspect is the element of the unknown. You don't see the enemy. In a place like Central America, you know to look out for booby traps or snipers. There are tell-tale signs that the enemy is in the area. But over there, something can just drop out of the sky.

Proceedings: To what extent were you restricted in your work?

Mathieson: You've always got to be thinking about how you're going to take the picture. You're in two modes. You're being creative in one, and censoring yourself in the other, saying "Make sure the oil refinery is not in the background. Make sure the water is not in the background. Is there a Kuwaiti jet in the picture? Is there a Saudi jet? Make sure it's only U.S. equipment. Is anything there that will give away security? Are there any markings that are not supposed to be there?" You've got to have tunnel vision when you're taking pictures over there. In the middle of the desert, where there's nothing for miles around, you're OK. It's when you're near air bases, or water, or anything big enough in the background that would be a tip-off. You have to be especially careful.

At one port, a company-sized element of U.S. Marines in red shorts, T-shirts that said Marine Corps on them, and combat boots suddenly came running down the road in formation. It would have been a great military "stomping their feet" type of picture, except in the background was a building with the name of the base on it. Obviously, this would tell you right where the Marines are located. So I couldn't take it. A lot of pictures are right in front of you, and you end up kicking yourself because you can't take them. But you can't say, "Guys, could you move over here away from that building for a minute?"

Proceedings: Do the officials in charge give you their rationale right down the line, or do you have to take what they say without explanation?

Mathieson: I served in the military for 11 years, and one of ~~my last duty assignments was running the photo~~ lab at the U.S. Army Intelligence and Security Command. So I'm strict about these things just by nature. I didn't need to have any reasoning from them. Besides, when you first arrive, you sign a document that lists all the ground rules you have to abide by.

Proceedings: Do you think any information that should be divulged to the public is being suppressed?

Mathieson: Picture-wise, no. But I think for the writers, maybe yes. I talked to a number of writers who really had their hands tied. The military has total control of you. You can't just jump in a four-wheel-drive vehicle and visit the troops. You can't find them, for one thing. And even if you do find them, you have to get through their perimeter security, which is virtually impossible by yourself.

GREG MATHIESON

EA-6B Prowler on board USS *Midway* (CV-41) in the Gulf

GREG MATHIESON

On the bridge of the USS *Fife* (DD-991) in the Gulf

GREG MATHIESON

U.S. Marines in Saudi Arabia

GREG MATHIESON

Media on the prowl with Marines in Saudi Arabia

Proceedings: Did you base all of your photographic decisions on the ground rules they gave you, or was someone looking over your shoulder all the time?

Mathieson: Someone is watching a good portion of the time. You have to take what they give you. The way the system works is that they have little wish lists that you fill out. You list who you are, where you're from, where you're staying, and what you want to see. They then sort these things out every few hours. When and if an opportunity comes up, they call you.

The military controls everything. There are no freebies. For example, it took me three weeks just to go to the local barbershop to photograph GIs getting haircuts! And that was a written request.

Proceedings: What is your overall impression of the DoD's willingness to cooperate?

Mathieson: In Washington, I didn't find it too helpful. I still don't find it too helpful. But on-site over there, once you've been there for a few days, you get to know some of the public affairs people and things improve. I've been doing this for years. I've been in their shoes, and I know what they're trying to do. I know where they're coming from, and mostly, their hands are tied. A lot of guys really want to try to help.

Proceedings: Are still photographers treated differently from the broadcast media?

Mathieson: In my opinion, the broadcast media get treated better. They have instant gratification on their side. Every evening on the six o'clock news in the states and in Saudi Arabia you see what happened that afternoon on TV. Back in the states the Secretary of Defense and the powers that be are watching and immediately get on the phone saying, "Great job today, Bob. Good show," and patting everyone involved on the back. So they tend to like TV a lot more because of that instant gratification. They know it changes public opinion immediately, for good or bad, right then and there. Still photographs take weeks, even months, to be circulated.

I tend to think that people remember stills a lot longer than they do TV. All the historic images of Vietnam that people remember are still images: the picture of the Vietcong being executed; the little girl running from the napalm. I can't think of one scene from Vietnam that I saw on TV that really sticks in my mind. There was just so much of it. You were being saturated with it every day.

Proceedings: Are foreign officials allowing U.S. photographers to photograph their troops and equipment?

Mathieson: Yes, to a point. The French aren't working out of the Joint Information Bureau. You have to go to their embassy and deal with them directly. The Brits and the United States are working side by side. We put in requests to cover joint U.S.-Saudi events, and three out of three times we showed up—but, the Saudis didn't. The U.S. troops were there, but no Saudis. So it's very hard. The Kuwaiti information office tried to put together trips to visit Kuwaiti military training, but unfortunately, most people never went because it was about an eight-hour drive across the desert and there was no guarantee of what you'd get when you got there. You might get there to find a dozen or so Kuwaitis cooking breakfast. That's too big a gamble to take. Time is too precious. This would amount to a two-day sacrifice.

Proceedings: What feel did you get for troop morale while you were there?

Mathieson: It goes both ways. There are guys out there who are real gung ho. They want to go over the border and chase the Iraqis. But the more senior people, the war veterans, are a little more quiet. They really don't want to see this happen. The young guys, who have trained for this for five years, are ready to kick ass. Some of the senior guys sit back and say, "It's great that this guy wants to get out there and shoot Iraqis, but reality is going to set in when the guy next to him gets his head shot off." It's a serious business, and some people aren't taking it seriously enough.

But the Marines are taking this dead seriously. You don't see any frills. You see their weapons, equipment, sandbags, cots, and camouflage netting. I noticed that the Marine units are training constantly. If you see Marines sitting together in the desert, chances are they're talking about first aid. Their commanders are constantly going around giving grid coordinates so the grunts can check them on a map. These guys are constantly honing their skills, because it's going to come down to basics for them. If you're out there in the middle of nowhere, you need to know where you are and how to get where you're going. When it comes to first aid, if your buddy gets hit, you need to know how to take care of him. Unlike Vietnam, where there were helicopters all over the place to do medevacs, I don't think it's going to be that kind of situation in the desert.

Naval Aviation

Leaner with Marines

By Captain Robert M. Nutwell, U.S. Navy

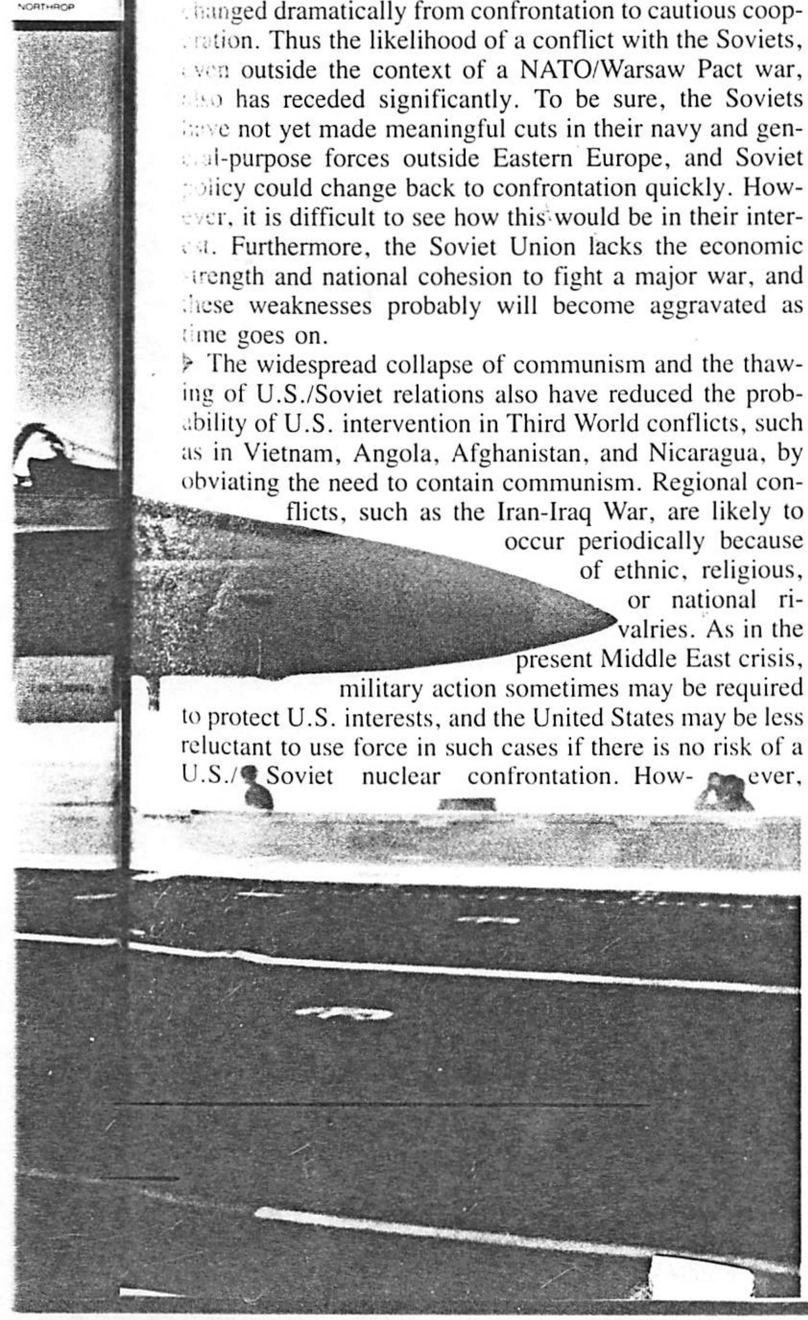
In adapting to this period of great change, naval aviation must focus on low- (or short-duration medium- or high-) intensity conflicts, while hedging against a renewed Soviet threat. Naval aviation's future also depends on a closer relationship with the Corps—here, a Marine F/A-18 pilot braces for a cat shot.

NORTHROP

The profound changes in the communist world that have occurred in recent years will influence the future missions of all services and branches. Thanks to its unique capabilities and outstanding record in crisis control, the Navy/Marine Corps team is likely to remain the "first team" among general-purpose forces in the post-Cold War world, and naval aviation will continue to be a crucial player on the team. However, as shrinking budgets force painful choices, aviation procurement planning and doctrine must be adjusted to reflect the changing mission.

The principal features of the international security environment that naval (i.e., Navy and Marine) aviation probably will face in the next two decades may be summarized as follows:

- The virtual dissolution of the Warsaw Pact means that a major European or global war precipitated by a Soviet attack on Western Europe is no longer plausible and will not occur in the foreseeable future.
- Soviet doctrine has become, at least for the near term, more defensive, and relations with the United States have changed dramatically from confrontation to cautious cooperation. Thus the likelihood of a conflict with the Soviets, even outside the context of a NATO/Warsaw Pact war, also has receded significantly. To be sure, the Soviets have not yet made meaningful cuts in their navy and general-purpose forces outside Eastern Europe, and Soviet policy could change back to confrontation quickly. However, it is difficult to see how this would be in their interest. Furthermore, the Soviet Union lacks the economic strength and national cohesion to fight a major war, and these weaknesses probably will become aggravated as time goes on.
- The widespread collapse of communism and the thawing of U.S./Soviet relations also have reduced the probability of U.S. intervention in Third World conflicts, such as in Vietnam, Angola, Afghanistan, and Nicaragua, by obviating the need to contain communism. Regional conflicts, such as the Iran-Iraq War, are likely to occur periodically because of ethnic, religious, or national rivalries. As in the present Middle East crisis, military action sometimes may be required to protect U.S. interests, and the United States may be less reluctant to use force in such cases if there is no risk of a U.S./Soviet nuclear confrontation. However, a prolonged conflict on the scale of the Korean War or the Vietnam War is unlikely without the threat of monolithic world communism or the support of a superpower.
- Third World nations and some terrorist groups will acquire increasingly more sophisticated weapons and weapons of mass destruction.
- Drug interdiction will continue to require the assistance of military surveillance assets.
- State-sponsored terrorism may decline somewhat without Soviet support, but state-sponsored and independent terrorist groups will continue to pose a serious threat to U.S. interests and citizens overseas.



NORTHROP

The most predictable strategic trend is the drastically shrinking funding for the Department of Defense. In conjunction with the changing threat, this reality will necessitate some reshaping of naval aviation.

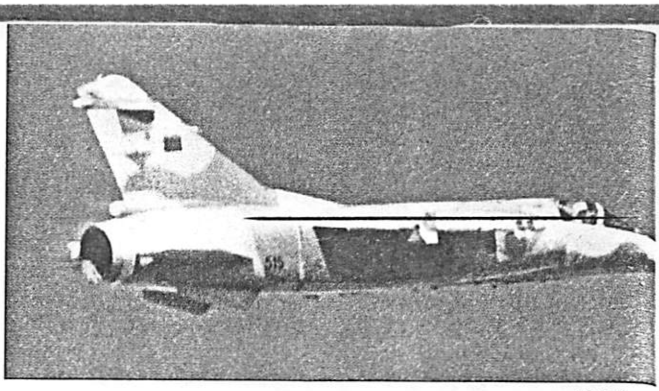
The plausible scenarios that remain for the employment of naval forces are mainly the protection of U.S. interests threatened by regional aggression, such as the Iraqi invasion of Kuwait, or countermeasures against international terrorism and drug trafficking. Specifically, the following scenarios are likely:

- Peacetime presence operations by forward-deployed units to promote U.S. interests in important regions, and to be ready to respond quickly to a crisis.
- Naval/air surveillance assistance to the Coast Guard and other countries to interdict traffic in drugs or other contraband.
- Expeditionary operations of limited duration, such as those conducted in Grenada and Panama, to stabilize a crisis situation or protect U.S. citizens.
- Retaliatory strikes, such as the strikes conducted against Libya in 1986 and against Iranian oil platforms and naval units in 1987 and 1988.
- Local sea control to protect U.S./friendly shipping, such as was conducted in the Persian Gulf during the Iran-Iraq War, or to mount a sea blockade, such as the present international blockade of Iraq.

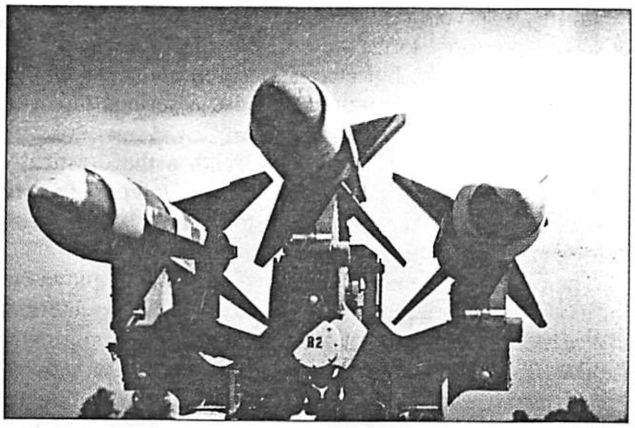
In sum, we can expect some low-intensity conflicts and an occasional medium- to high-intensity conflict of short to moderate duration. Barring a resurgent Soviet threat, the United States is unlikely to be involved in a sustained multi-theater high-intensity conflict in the foreseeable future. The Third World scenarios always have been more likely than direct military action against the Soviets, even at the height of the Cold War. However, the possibility of a U.S.-Soviet confrontation forced us in the past to prepare first for this worst-case scenario. Now the Soviet military threat has receded enough that we can afford to tailor our force structure and doctrine more toward the Third World scenarios, while retaining a significant anti-Soviet capability as a hedge against a Soviet change of heart. The present Middle East crisis demonstrates that we need to make this adjustment.

The Third World threat differs from the Soviet threat both qualitatively and quantitatively. From a qualitative standpoint, there is considerable overlap between the threats, particularly in tactical air forces and air defenses. Indeed, in some cases where Third World nations have imported Western instead of Soviet systems (e.g., Hawk

The current Third World threat includes plenty of sophisticated Western hardware: Iraq's captured U.S.-built Hawk antiair missile system and Libya's French-built Mirage F-1 fighter.



U.S. NAVY



E. SIMONSEN

and Exocet missiles), their capabilities actually exceed those of the Soviets. However, the two Soviet systems most threatening to carrier battle groups—nuclear submarines and bombers firing long-range missiles—are unlikely to appear in the Third World in significant numbers because they provide at great cost a geographical coverage that exceeds the needs of most countries. The Third World equivalents to these threats—diesel submarines and tactical aircraft with short- and medium-range missiles—are dangerous in their own right but require somewhat different countermeasures. Perhaps the most alarming aspect of the Third World threat is the proliferation of weapons of mass destruction; some Third World countries, such as Iraq, may be more likely to use such weapons than the Soviets were.

Quantitatively, the Third World threat is significantly less challenging than the Soviets. Future conflicts are likely to be localized (because we would be fighting one or two countries rather than a superpower-led bloc) and of shorter duration than the hypothetical anti-Soviet war (because none of our likely Third World opponents, including our present antagonist Iraq, has the means to sustain a long war).

To assess the implications of these developments for naval aviation, we will look at their influence on each warfare area.

Antisubmarine Warfare: The emphasis will shift from the nuclear to the diesel threat, and from deep open-ocean to shallow coastal/restricted-water operations. The numbers and geographical scope of the submarine threat will be greatly reduced, but the remaining threat will be challenging in some scenarios. On balance, antisubmarine warfare probably should receive lower priority in the allocation of resources.

Antiair Warfare: The emphasis will shift from defending against long-range air-, surface-, and submarine-launched cruise missiles to defending against tactical aircraft with short-range weapons. The classic, open-ocean, outer air battle scenario will be less likely. Engagements will occur over or near land; surveillance requirements will include detection and identification of small, slow targets, such as drug runners and terrorist aircraft; and positive (not necessarily visual) identification normally will be required prior to engagement.

Antisurface Warfare (ASUW): The emphasis will shift to targets that are significantly smaller and less capable of offensive action and self-defense than Soviet naval units. Patrol craft (some equipped with missiles), terrorist craft, and drug runners are the most likely surface targets. Most ASUW operations will be conducted in coastal regions, and in the presence of many noncombatant vessels. Positive identification normally will be required prior to engagement. Surveillance requirements will include detection, identification, and observation of vessels as small as speedboats, and boarding and search will be required in conjunction with quarantine operations.

Strike Warfare: The basic strike warfare missions will remain: fixed-target strike, interdiction, close-air support, counter-air, suppression of enemy air defenses, and reconnaissance/battle damage assessment. We will need the ability to kill large numbers of armored vehicles quickly and with acceptably low aircraft attrition. Air defenses may be as dangerous as in the Soviet Union. Target acquisition will continue to be one of the greatest impediments to mission success. Precise weapon delivery accuracy will be required to avoid collateral damage to friendlies and noncombatants. Aircrew loss or capture will be less tolerable, promoting greater reliance by policymakers and tactical commanders on missiles and other unmanned air vehicles where feasible, and enhancing the need for an effective combat search-and-rescue capability.

Electronic Warfare (EW): Two factors will enhance the effectiveness of existing electronic countermeasures (ECM) systems: the deployment of stealth vehicles, and the generally greater vulnerability of Third World weapon systems to countermeasures than their Soviet counterparts. On the other hand, the desire to minimize losses on both sides will reinforce the need for strong ECM capabilities. On balance, we will need sophisticated capabilities across the spectrum of EW—including stealth airframes, radar and communications jamming, antiradiation missiles, decoys, and self-protection equipment—to penetrate Third World air defenses with acceptable (that is, minimal) attrition to manned aircraft. Stealth technology is a powerful form of electronic warfare, and we should assess the effect of this technology on our needs for the more conventional forms of EW. In sum, we need to continue investing in high-end EW, including stealth technology, to ensure adequate manned aircraft and cruise missile survivability in future conflicts.

Mine Warfare: The threat of mines to friendly shipping will grow as potential Third World adversaries acquire more sophisticated mines. Persian Gulf operations demonstrated the potency of this threat, even when based on obsolete mines. In addition to modern, robust countermeasures, we will need a greatly improved surveillance capability to detect and interdict covert minelaying. In this respect, the enhanced surveillance requirements of ASUW and mine warfare converge, and naval aviation will play a key role in providing this surveillance.

Special Warfare: SpecWar forces will play a greater role in an environment of predominantly low-intensity conflicts. Covert insertion/extraction, communications, and tactical/logistical support of SpecWar forces will become important missions for Navy and Marine aviation.

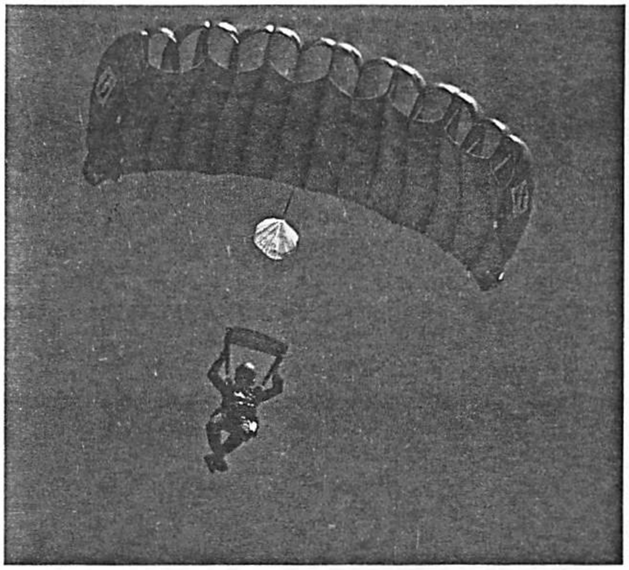
U.S. NAVY (K. CROWDER)

Logistics: Sustainability requirements will be reduced, since potential adversaries would present fewer targets, and they do not have the firepower or logistical support of the Soviet-bloc armed forces. However, the likelihood of long supply pipelines will remain, and we must be able to outlast a worst-case Third World adversary (Iraq) in a mid- to high-intensity conflict.

This mission area survey suggests the following conclusions regarding naval aviation force structure and required capabilities.

Fighter Attack Squadron (VFA)/Marine Fighter Attack Squadron (VMFA): The F/A-18 is effective across the spectrum of potential conflicts, and it is particularly well-suited to Third World scenarios. An excellent air superiority and ground attack fighter, its multimission capability and affordability will be vital to retaining air wing effectiveness in an era of shrinking budgets. The planned radar upgrade and greater fuel capacity are the most urgently needed improvements. We also need the advanced tactical aerial reconnaissance system reconnaissance variant to replace the aging F-14 Tactical Air Reconnaissance Pods.

Fighter Squadron (VF): The F-14D will be highly capable in both the air superiority and fleet air defense missions. To enhance the air wing's multimission capability, we should give the F-14D an air-to-surface capability. Aging airframes, funding shortfalls, and the recently announced delay in developing a replacement may reduce VF force levels starting in the late 1990s. To preclude this, we should attempt to extend F-14D new production. If necessary, Marine F/A-18 squadrons could be used to fill out the air wings.


ROBERT GENAT

Potential Third World adversaries are particularly vulnerable to electronic countermeasures (left, an EA-6B prepares for launch from the *Forrestal* [CV-59]) and to special warfare forces, which can be inserted, extracted, and supported by naval aviation.

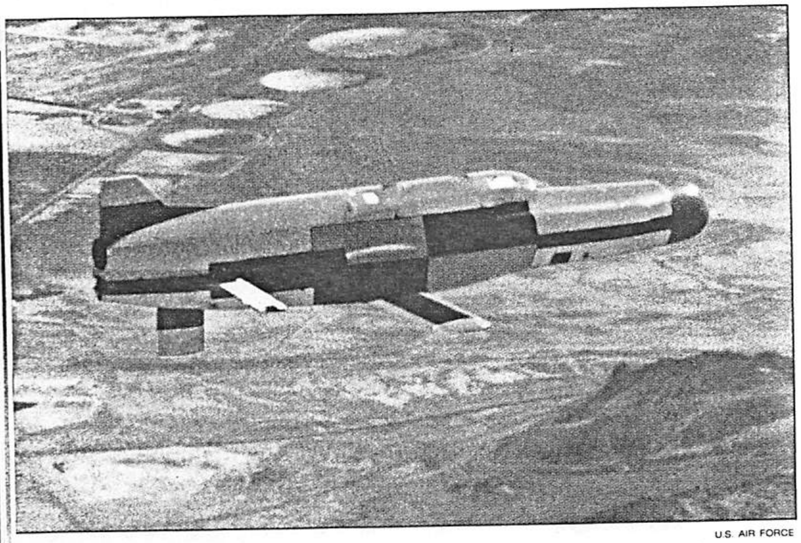
The follow-on to the F-14D should be a stealthy aircraft capable of supersonic cruise. These two capabilities provide a quantum improvement in tactical effectiveness in both the air superiority and fleet air defense missions, and they are needed to stay ahead of future Soviet and Third World fighter capabilities.

Developing a common aircraft to replace both the F-14 and F/A-18 would enhance air wing flexibility and reduce support costs. However, the F/A-18 follow-on must be affordable in large numbers and have a good ground-attack capability. It is not clear if a single aircraft can meet all of the VF/VFA requirements. Another option would be to replace the F/A-18 and AV-8B with a common advanced short-takeoff-vertical-landing (ASTOVL) aircraft. The attractiveness of this course will depend on the development of STOVL propulsion technology that does not penalize mission performance. We have a few years to decide which option is best.

Marine Attack Squadron (VMA): The A-12 is needed to replace aging A-6 aircraft and to enable the execution of future manned strike missions with acceptable aircrew risk. The A-12 will be particularly effective at night, thus enabling the air wing to maintain round-the-clock pressure on the enemy. The aircraft should be able to use the Maverick missile and the Advanced Interdiction Weapon System (AIWS) for interdiction and close air support; it also needs a stealthy standoff weapon for attacking high-value fixed targets, which can be expected to have strong terminal defenses. If budget constraints preclude procurement of the planned number of A-12s, Marine FA-18D squadrons should be integrated into Navy air wings to fill the gap, albeit with some loss in capability.

Unmanned Vehicles: Cruise missiles and other unmanned air vehicles (UAVs) can make an important contribution to future air operations, particularly in strike and antisurface warfare, by conducting some high-risk missions and supplementing or supporting manned aircraft on other missions. Cruise missiles, such as the Tomahawk and the Standoff Land-Attack Missile (SLAM), can strike many fixed targets; UAVs can conduct air-defense suppression and some bomb-damage assessment and reconnaissance missions. We should continue to improve the lethality, targeting flexibility, and survivability of the Tomahawk and SLAM; we should deploy stealthy follow-ons to these weapons; we should proceed with the reconnaissance and targeting UAVs now under development; and we should procure the Tacit Rainbow radar decoy in adequate numbers.

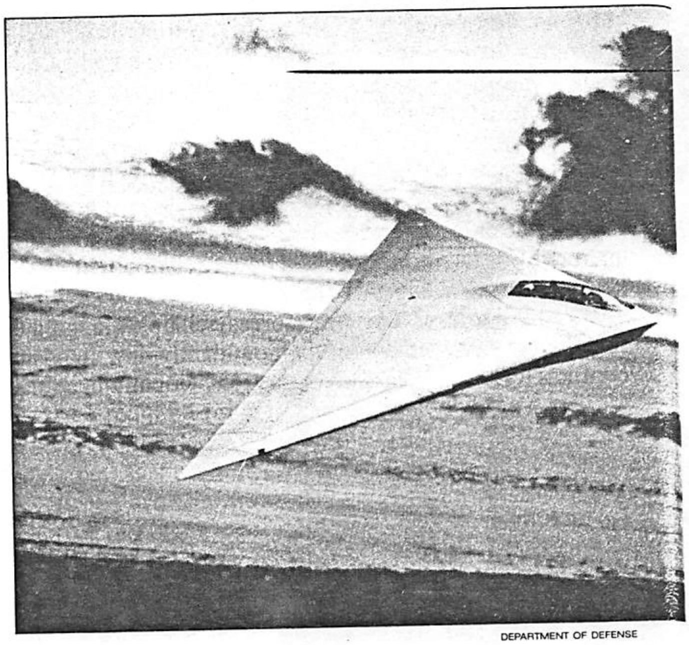
Cruise missiles and other UAVs lack the lethality, tactical flexibility, and sustainability of manned aircraft. However, they will provide an adequate capability for some missions, and they will improve with evolving technologies, such as advanced sensors and artificial intelligence. A mix of manned and unmanned vehicles will provide the best capability for strike and antisurface warfare in the future.


U.S. AIR FORCE

For strike and antisurface warfare missions, the best bet will be a mix of unmanned (here, the Tacit Rainbow antiradar missile) and manned (the A-12, scheduled to replace the A-6) air vehicles.

Tactical Electronic Warfare Squadron (VAQ): We should continue the transition of all EA-6B squadrons to the advanced capability (AdvCap) version, which is needed for its expanded jamming capability. The EA-6B follow-up aircraft should employ the A-12 or follow-on VF/VFA airframe for commonality.

Carrier Airborne Early Warning Squadron (VAW): Airborne surveillance will be indispensable in most post-Cold War scenarios. However, VAW aircraft must be given better overland/near-land capability. Sophisticated counter-countermeasures and counter-stealth capabilities should receive less emphasis. A standoff noncooperative target recognition capability is urgently needed. To save funds for more urgent needs, we should consider deferring development of the Advanced Tactical Support (ATS) aircraft and continue E-2 production instead. The E-2 airframe design will provide adequate capability for the VAW mission for many more years.


DEPARTMENT OF DEFENSE

Air Antisubmarine Squadron (VS): Since the S-3 has excellent surface surveillance capability and a respectable capability against diesel submarines, it will be a key player in Third World contingencies. The S-3 and its successor should be equipped with a sensor that can positively identify surface craft and observe deck activities such as minelaying operations from outside the effective range of shoulder-fired surface-to-air missiles. VS aircraft also should be equipped with a weapon such as Maverick or Penguin to engage small, low-value surface craft from a safe standoff range. Procurement of the ES-3A should continue in order to provide the battle group commander with an organic electronic support capability. To better reflect the importance of the antisurface as well as antisubmarine mission, the VS squadron's designation should be changed to sea control squadron. To avoid the cost of developing a new ATS airframe, the S-3 should be replaced with a variant of the V-22, or by reopening the S-3 production line.

Helicopter Antisubmarine Squadron (HS)/Light Antisubmarine Squadron (HSL): The excellent surface surveillance and antisubmarine capability of the SH-60 and SH-2 will be indispensable in many future scenarios. LAMPS I and III already have proved their worth in low-intensity conflict in the Persian Gulf. For better performance against diesel subs, LAMPS needs a dipping sonar. Both HS and HSL aircraft need the standoff surveillance sensor and air-to-surface weapon proposed earlier for the S-3. We should consider combining the HS and HSL communities, since they will be operating similar aircraft in the same type of missions. The squadrons should be designated helicopter sea control squadrons.

Patrol Squadron (VP): The utility of VP aircraft in anticipated scenarios and the sensor/weapon requirements to perform the surface surveillance mission are essentially the same as stated for VS. Lack of access to in-theater bases may hamper VP operations in some future scenarios. The VP community should shrink somewhat in response to the reduced Soviet threat, and budget constraints may require that the P-7 procurement be deferred. However, patrol aviation will continue to play an important role in peacetime surveillance operations, in many Third World scenarios, and as an insurance policy against a resurgent Soviet submarine threat.

Fleet Air Reconnaissance Squadron (VQ): Like ECM, electronic support will be especially effective against Third World adversaries, many of whom lack sophisticated protection capabilities. Therefore, we should retain the present VQ force structure and maintain a modern mission package in the EP-3 and ES-3 aircraft.

Weapons and Sensors: New systems of limited utility against non-Soviet threats, such as the Advanced Air-to-Air Missile (AAAM) and counter-stealth sensors, should be developed but not procured until they are needed to counter Third World threats. The Advanced Medium-Range Air-to-Air Missile (AMRAAM) must be procured to provide the F/A-18 with a multitarget, "launch-and-leave" engagement capability. VF/VFA aircraft need the capability to identify positively a noncooperating target beyond maximum weapon engagement range, and they need an advanced dog-fighting missile with significant off-boresight capability coupled to a helmet-mounted sight.

Improved land-attack cruise missiles and unmanned air vehicles for reconnaissance and defense suppression should be developed. An affordable, outside-point-defense stand-off weapon, such as the Advance Interdiction Weapon System (AIWS), and a modern family of cheap, level-of-effort bombs (guided and unguided) are needed. To enhance survivability and CAS/interdiction/strike mission effectiveness, strike aircraft must be able to acquire the target and employ air-to-ground weapons from high altitude with surgical precision in all weather. Navy tactical aircraft also need a smart stand-off weapon that can kill several armored vehicles per pass, such as the submunition warhead planned for the joint Army/Air Force Tactical Missile (JTACMS).

A standoff electro-optical surface surveillance sensor and short-range attack weapon are needed for VS, HS, HSL, and VP. New antisubmarine weapons and sensors should be optimized against diesel-electric submarines operating in relatively shallow water.

Self-protection Equipment: All Navy/Marine aircraft should be fitted with an effective radar warning receiver, a missile warning system, and improved decoys that can respond automatically to an approaching missile. We should buy enough EW equipment to ensure its availability for deployments and for training between deployments.

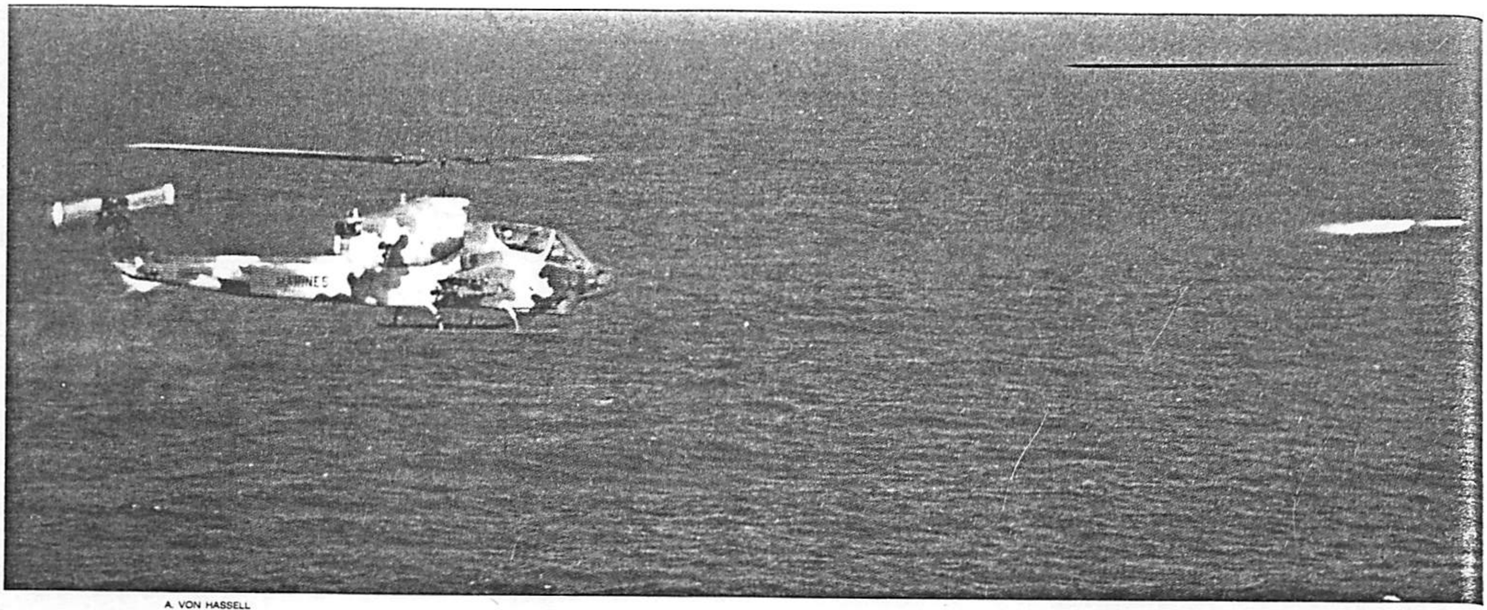
Marine Aviation: The V-22 is urgently needed for Marine assault and special operations. It provides a revolutionary capability that is well-suited for Third World conflicts. Proposals to substitute a mix of existing helicopters for the V-22 would make a major sacrifice in capability for insignificant savings, considering that much of the V-22 development cost already has been paid. The V-22 is also needed for Navy strike rescue and to replace the S-3. The Navy should attempt to reverse the Department of Defense decision to cancel the V-22, and we should be willing to economize in other aircraft replacement and procurement programs in order to buy this uniquely capable aircraft for the Marine Corps and for other applications.

The rest of Marine rotary-wing aviation and the Harrier squadrons are well-suited to likely future scenarios. Improved night/all-weather attack capability for the AH-1W Sea Cobra should receive high priority, and we should sponsor an international project to develop an advanced VSTOL or STOVL to replace the AV-8B. The new aircraft should be supersonic, employ stealth technology, be capable of all-weather (not just clear night) CAS, and have a beyond-visual-range air-to-air capability.

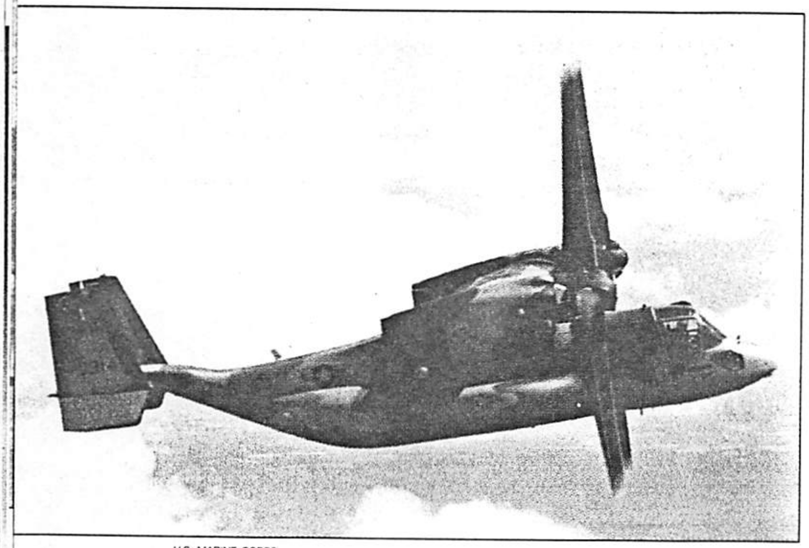
The conventional, land-based Marine tactical air wings are hampered by the lack of airborne surveillance capability and by the uncertain availability of land bases. Nevertheless, these wings are needed to provide adequate, responsive support of the ground combat element when bases have been secured. The Marine Hornet and Prowler squadrons also provide a ready reserve which the commander in chief can use to replace carrier air wing losses, to reinforce an ally, or for other purposes.

HALBERSTADT

The SH-60B LAMPS III helicopter proved its worth during low-intensity conflict in the Persian Gulf. It is time to think about combining the helicopter ASW and light ASW squadrons into a helicopter sea-control squadron.



A. VON HASSELL



U.S. MARINE CORPS

Two high-priority "fixes" for Marine Corps aviation are obtaining an improved night/all-weather attack capability for the AH-1W Sea Cobra and procuring the MV-22.

Air Support for Expeditionary Operations: Traditionally, naval commanders have refused to tether the carriers to a land campaign for fear of sacrificing their mobile striking power and increasing their vulnerability. The traditional policy was sensible in World War II and in a hypothetical global war with the Soviets. However, in the conflicts envisioned in the post-Cold War era, the threat to the battle groups will be much lower, and the carriers are unlikely to be employed in other missions during an expeditionary operation. (This was the case in the Korean and Vietnam wars.) Furthermore, in many scenarios carrier air wing support will be needed for airborne surveillance or because there are no suitable bases for the Marine tactical air wings. Thus, Navy doctrine should be altered to state that carrier air wing support normally will be provided for a Marine expeditionary operation.

To enhance the ability of Navy air wings (CVWs) to support Marine operations, we should consider designating an augmenting Marine VMFA squadron for each Navy air wing. While not usually deployed on the ship, the VMFA squadron would work up with the air wing, would maintain carrier landing currency, and would join the CV/CVW during a portion of the deployment. If the need for an actual expeditionary operation arose, the augmenting squadron could be deployed within a few days. Carrier deck space would be made available by temporarily shore-basing those aircraft not needed for the operation.

The association of the augmenting VMFA squadron with its host air wing would enhance the Navy air wing's proficiency in air support for ground forces. In an actual expeditionary operation, the additional Hornet squadron would increase the fire support available to the ground combat element in the crucial initial phase before land bases have been secured. The augmenting squadron would move ashore once a base became available.

Naval aviation can adapt to the new strategic and fiscal climate by tailoring operational capabilities more toward Third World contingencies (while retaining a significant capability to deal with the less-likely Soviet threat) and by welding a closer marriage between Navy and Marine aviation. The result will be a leaner naval air arm better suited to the challenges, like the recent Iraqi aggression in the Middle East, that certainly await us in the post-Cold War era.

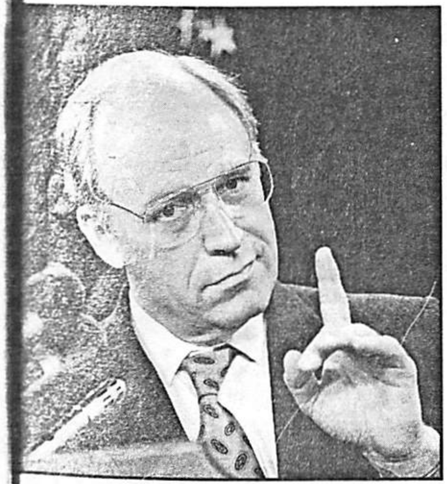
Captain Nutwell is the prospective commanding officer of the USS *George Washington* (CVN-73), which is under construction in Newport News, Virginia. He has served as commanding officer of VA-105, executive officer of the USS *Nimitz* (CVN-68), director of an air warfare intelligence assessment team, and commanding officer of the USS *Trenton* (LPD-14). Captain Nutwell is currently qualified in the F/A-18 Hornet.

It's the "M" Word—MOBILIZATION

By Captain J. R. Avella, U.S. Naval Reserve

Not only must U.S. leaders contend with the fear that a country only mobilizes for one reason—war—they also must work through a set of complex and unwieldy procedures that at every step discourage the involuntary recall of reservists. Desert Shield is the only operation that has met all the criteria. Why?

On 22 August 1990, President George Bush authorized Secretary of Defense Dick Cheney to order members of the Selected Reserve to active duty, in support of U.S. military operations in the Middle East. This marked the first time that this authority was used since its passage by Congress in 1976.[1] Why this time, and not others?[2] A close look at this case and other recent ones can reveal indicators upon which to base future recommendations and decisions about the use of involuntary recall authority.


DOD (R. D. WARD)

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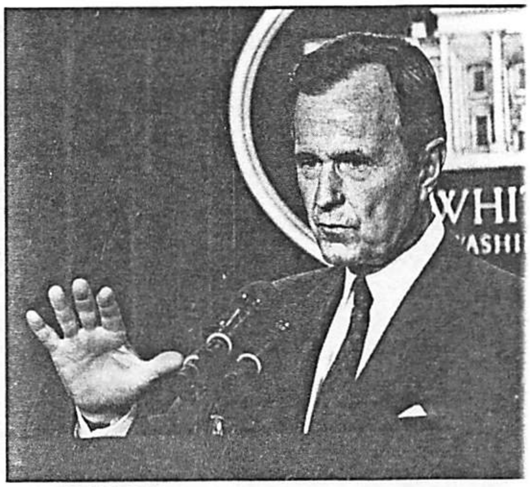


WHITE HOUSE (C. T. POWERS)

Let us first proceed through a hypothetical request for use of this authority, as it moves from its originator all the way to the President of the United States for decision.

A request for use of the authority usually comes from one of two sources: either an individual service (initiated by the service secretary) or one of the 11 unified and specified commanders. The Desert Shield request originated from the U.S. Central Command. In responding to a crisis, the unified commander first develops an operational plan, based on the commander's estimate. He then assigns the individual service component commanders to provide the forces needed to carry out the plan.

Should any one service be unable to meet the force requirements with existing assets, it has a number of choices. Let us look at four:

- ▶ It can attempt to negotiate a different force mix (e.g., instead of two antisubmarine-warfare-capable ships, how about one ship and one maritime patrol squadron?).
- ▶ It can ask another theater service components commander to make up the shortfall. (Can we transfer assets from the Atlantic to the Pacific Fleet?)
- ▶ It can access resources in the reserve component by seeking volunteers.

▶ It can state that the only way to meet the plan is by involuntarily accessing reserve assets and recommend use of that presidential authority.

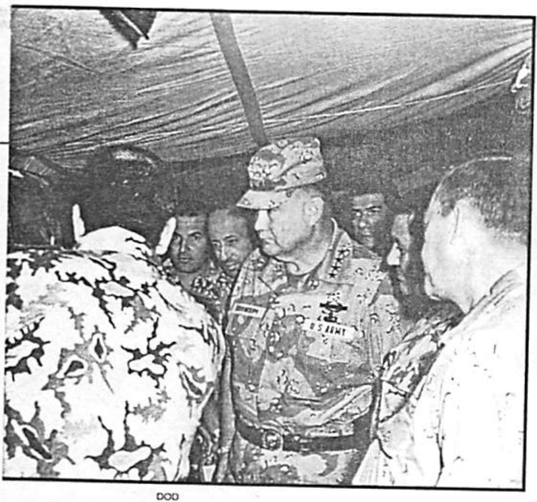
Recognizing that the first three options can be exercised within a service or theater—based strictly on decisions made within the military establishment—it is easy to understand why involuntary recall is the least-favored one.

Be that as it may, let us assume that the service has decided to seek use of the authority, and proceed to the next step. Assuming that the Goldwater-Nichols Act is followed to the letter, the unified commander requests that the Secretary of Defense recommend use of the authority to the President. The Secretary of Defense probably would ask his senior military adviser, the Chairman of the Joint Chiefs of Staff, to review the situation and make a recommendation. The Chairman likely would have the Joint Staff review the plans, then call a meeting of the service chiefs to discuss the issue in detail.

At this point in the chronology, it is well to examine each service's basic view of reserve participation:

▶ *The Marines:* The Marine Corps has designed its force so that most contingencies can be handled by the active force. Use of Marine Corps Reserve assets short of mobilization is not anticipated. It is safe to assume that the Marines probably would not have asked for such a recall.

▶ *The Air Force:* Among its many missions, the Air Force has placed significant percentages of its lift capability in the reserve component. Crisis response requiring significant lift cannot be handled exclusively by the active component. To offset, partially, this lack of readily available resources, the Air Force has established an extensive and well-organized volunteer program, which includes the budgeting of extra days of active duty per year per reservist, and delegates control and order-writing to the unit level. If the Air Force had been the component that was short of active-duty resources, the unified commander might never have known because volunteers would already have been solicited (and activated), so no shortfall would have been reported.



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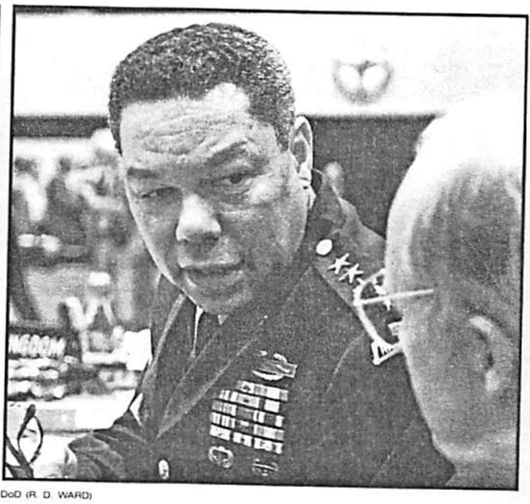


DoD (R. D. WARD)

G. E. MATHIESON/MAI

▶ *The Navy:* With some notable exceptions, the Navy can handle most contingencies without bringing reservists on active duty. Without rekindling the Earnest Will (the 1987–88 reflagging of Kuwaiti tankers) debate, in the only recent significant case where it came up short, the Navy used its internal options, rather than seeking political approval for involuntary recall.

▶ *The Army:* The Army made conscious decisions during the post-Vietnam War force reductions to place most of its combat support and combat service support capability into the reserve component. That decision means that any significant military operation will require reserve forces. (The key word is "significant.") Again, without reopening prior debate, in its most recent action, Operation Just Cause in Panama, the Army sought and activated enough volunteers to meet its needs.

Let us return to the Chairman's meeting. At this point, should the Joint Chiefs decide to concur with the unified commander's recommendation, the decision must come despite their very human reluctance to admit that they cannot do the job with the forces they themselves can put together. Other factors can also play a part. One, for example, is a suspicion that the political establishment would not approve a recall anyway. In addition, there is a perceived restriction in the law that makes it hard to recall reservists below the unit level if complete units are not required at the time.[3]

Assume that the Chairman's meeting has brought unanimous concurrence with the unified commander's recommendation.[4] (Unanimous decisions are not required by Goldwater-Nichols, but in practice it is doubtful that any Chairman would risk a less-than-unanimous result on a matter of this severity—since ultimately it could become a matter of public record.) After receiving concurrence from the Joint Chiefs, the Secretary of Defense seeks further counsel from his own staff and another series of questions and alternatives arises. Since the unified commander usually states the number of reservists he wishes to recall, the list must be evaluated to ensure that all the forces called are truly needed.[5] In addition, the Department of Defense and International Security Policy and Affairs staffs will be queried about possible reactions from allies and adversaries, since the Secretary will probably have to defend his position in the National Security Council (NSC).

But despite the possibility of a later "thumbs down," the Defense Secretary signs the recommendation. He then proceeds to the NSC for the final act of this drama. To open the meeting, the Secretary of State tells everyone that even though the law was written as a force-augmentation authority (rather than a mobilization action), the international community perceives any involuntary recall of even one reservist as the dreaded "M" (mobilization) word.[6] Next comes the domestic policy adviser, who tells the President that Congress is concerned about the administration's handling of the crisis and hopes that the President does not plan to call up reserves "to make up for timidity in dealing with the crisis early on."

Given the political inputs, what would you, as President, require of the situation before you proceeded? Or going back in the course of events, if you were the unified commander—and you knew all the hurdles that had to be cleared—how significant would your requirement have to be, before you would even ask?

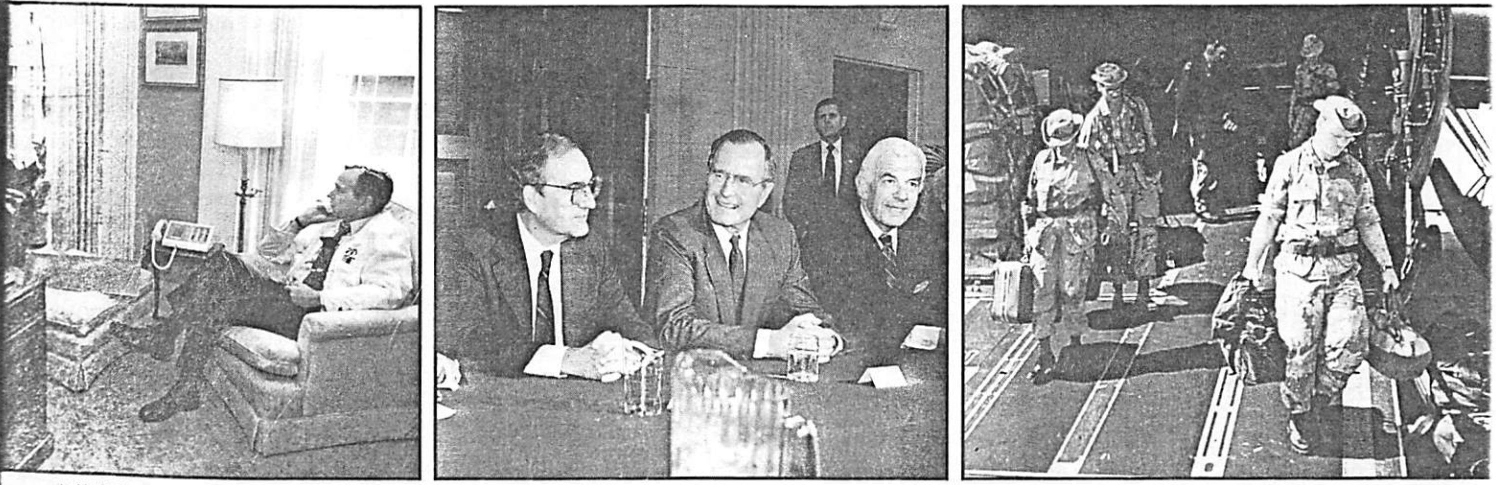
From what we have seen so far, it appears that the key to the use (or nonuse) of the involuntary recall authority can be found in four basic factors. Two are essentially military; two are political.

Military Factors: Volunteerism is the option a service normally will prefer, since it can be handled internally and it does not require political approval. Therefore, if volunteerism can be made to work, it will be used first. Only when the anticipated duration and force requirements exceed the bounds of volunteerism will the use of the recall authority be pursued. Factors that must be considered are the duration of the crisis and the size of forces required.

▶ *Duration:* Duration must be considered on two levels. The first is the calendar duration of the requirement. The second looks to how the requirement is fulfilled. For example, there may be a requirement for ten C-141 flight crews for ten weeks. Whether the requirement is fulfilled by ten crews for ten weeks or by 100 crews, each for one week, perhaps matters little. Indeed, if 100 crews were available and willing, volunteers could handle the entire ten-week requirement. On the other hand, a minesweeper crew needed for ten weeks probably cannot (and should not) be filled by ten crews for one week each, because unit cohesiveness and training would not exist. For the sake of argument, assume the ten C-141 flight crews example to be atypical, since only the Air Force deals with it, and the ten-week minesweeper requirement more reflective of the remaining three services' requirements.

Another factor is that for operations that last less than 30 days, recent history has recorded no dearth of volunteers.[7] Right from the start, use of the authority for operations of this duration yields little benefit. Operations anticipated to extend beyond 30 days, however, begin to be worth the time and effort needed to recall reservists. The number of volunteers who can readily leave their homes and places of employment for more than 30 days drops drastically.[8] Such a drop could be offset by calling a small number of needed reservists from a large reserve population to augment the active forces. Consider an operation such as Just Cause, which required extensive airlift for a very short period. Once the surge was over, relatively few flight crews from a large population in the Air National Guard and Air Force Reserve could sustain operations using volunteers for an almost limitless amount of time. Again, this is unique to the Air Force and is probably atypical.

From the perspective of duration, let us examine Operation Desert Shield. Few would challenge the assessment that we have been dealing with a megalomaniac. Saddam Hussein carried out an eight-year war against Iran, and in the present case he invaded Kuwait and announced its annexation. With more than a million men under arms—400,000 in Kuwait—he is not inclined to back down easily. Our willingness to support and defend Saudi Arabia means that we are in it for the duration and, as Dick


WHITE HOUSE

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First, the unified or specified commander (General Schwarzkopf, left, for Desert Shield) requests that the President call reservists. Then the Defense Secretary consults with the JCS Chairman. Next, the JCS meets to discuss the issue. Assuming concurrence there, the NSC next considers the request. Finally, political realities dictate that the President consult congressional leaders about his decision. Only then can reservists go to Saudi Arabia.

Cheney put it, the duration could be years.

Based on a limited sampling it is easy to postulate that use of this authority requires a military operation that is projected in months—not weeks or days. This also makes political sense. No President will use involuntary recall authority to disrupt the lives of reservists for only a few days or weeks.

- *Size of Reserve Forces:* While 10 USC 673b permits the President to call as many as 200,000 of the more than one million Selected Reservists in the seven reserve components, a threshold exists below which use of the authority makes no sense. The hard part is determining just where that threshold is—since it will vary, depending on many factors, few of which may have anything to do with the requirement. In Operation Earnest Will, the domestic political sensitivity of the situation meant that use of the authority to access the Naval Reserve Force minesweeper crews, who numbered less than 200 people, was not worth expending a presidential "silver bullet." In Operation Just Cause, the numbers of reserves required were also small, and when coupled with the need for specialized talents that were not available in integrated units, likelihood of involuntary recall was equally slim.[9]

On the other hand, the initial six-week callup for Desert Shield involved more than 45,000 people. With a range of hundreds (Earnest Will and Just Cause) to thousands of reservists tapped (Desert Shield), it is hard to fix a threshold. Logically, required reserve augmentation could range from thousands to tens of thousands.

Political Factors: The two political factors that would affect a decision about use of the recall authority are the severity of the crisis—domestic and international—and the political climate.

- *Severity of Crisis:* The scope of the military operation is usually indicated by the severity of the crisis.

During Operation Earnest Will, the military mission was twofold: Shipping lanes had to remain open in the Straits of Hormuz to ensure adequate flow of oil to the world's markets, and the U.S. Navy had to escort tankers bearing the U.S. flag to protect them from Iran and Iraq. The United States took neither side; it offered protection from both belligerents, with the threat from Iran perceived as being greater. There was no opposition force, per se, and neither belligerent sought U.S. involvement.

The mission for Operation Just Cause was threefold: to protect U.S. lives and interests in the Panama Canal Zone, to remove the Noriega government and replace it with the duly elected Endara government, and to apprehend Manuel Noriega, if possible. The main opposition was the Panama Defense Force, a 10,000-man paramilitary force loyal to Noriega. To accomplish this mission, the United States used a force of approximately 25,000, about half of whom were already in Panama.

Iraq brought on Operation Desert Shield, by seizing Kuwait and threatening Saudi Arabia. If Saddam Hussein had succeeded, he would have exerted control over more than one-half of the world's known oil reserves. The Saudis requested security assistance for protection against the battle-hardened, million-man Iraqi Army. To provide this assistance, the United States sent Army and Marine Corps divisions (infantry, airborne, and armored), Air Force tactical fighter and ground support wings, and Navy carrier battle groups, amphibious task forces, and a battleship surface action group.

The gap between the operational requirements of Earnest Will and Just Cause, and those of Desert Shield, is wide. The first two needed forces in the low tens of thousands; the latter exceeds 300,000. The first two were predominately single-service operations; the last is a multiservice operation. There are still insufficient data to establish a threshold for crisis severity, but we still can identify some minimum operational requirements: extensive participation from all services and the presence of a real threat to U.S. vital interests. The degree to which our vital interests were involved in either Earnest Will or Just Cause was minor compared to Desert Shield.

- *Political Climate:* On the domestic side, the three operations brought out a full range of domestic political response.

Public opinion about Operation Earnest Will was neutral and there was well-documented contention between the White House and Capitol Hill over U.S. presence in the Persian Gulf, particularly as it related to the War Powers Act.[10] The operation lasted for more than two years and was essentially ended by an Iran-Iraq truce after their eight-year war.

Operation Just Cause elicited positive reaction from both the public and congressional sectors. It lasted only weeks, and quickly faded from public and congressional view.

In its initial stages, Operation Desert Shield also elicited strong support from both the general public (at one point, the President had more than 75% agreement in the polls) and the Congress. Support for the operation already has begun to wane, but there is a perceived domestic justification in U.S. actions because the gas lines of 1973 and 1979 are still vivid in the public's memory.

The international scene offers a much different perspective. During Earnest Will, the United States was denounced repeatedly for interfering in Middle East and Arab politics. In Just Cause, there were accusations that the United States had violated the Rio Treaty and forced itself on Panama—although behind the scenes, most allies were glad that the United States had finally dumped Noriega.

Such has not been the case for Desert Shield. In the multipolar world's first real crisis, the overwhelming majority of countries deplored Iraq's annexation and the United Nations Security Council voted to authorize use of military force to carry out sanctions.

Recall the Secretary of State's remarks at our hypothetical NSC meeting. There, the only fear was that the international community would perceive that the United States was mobilizing its reserves for war. But, of course, the United States wanted Iraq to be fearful. In this, it succeeded—to the extent of precluding an attack on Saudi Arabia. Many doubt the President would have used the authority in the old Cold War environment; changes in the East-West balance of power may have been the prime reason for his demonstrating the political will to exercise involuntary recall.

Based on recent events, then, four criteria must be met before a President will augment the active force under 10 USC 673b:

- A large number of reserve forces required—at least in the thousands
- An anticipated duration of months or longer
- A crisis severe enough to involve all the services and to threaten gravely U.S. interests
- An international and domestic political environment that is sympathetic to involuntary recall of reservists

In applying these tests to Earnest Will, we find that the number of reserve forces required would be small, the crisis not significant enough, and the political environment not supportive of a callup. Applying them to Just Cause yields the same result. Operation Desert Shield is the only contingency that meets all four criteria.

These four rules of thumb can be a valuable part of force planning. In building the total force, the services must be able to predict with some certainty when they can count on the reserve component being subject to involuntary recall.

Under Title 10, U.S. Code, section 673b (10 USC 673b), the President may order as many as 200,000 Selected Reserves to active duty in support of an operational mission.

The use of 10 USC 673b was considered during the Earnest Will and Just Cause operations, in the Persian Gulf and Panama respectively. In neither case was the Secretary of Defense asked to request the President to invoke the authority.

[3] DoD guidance, after executing the authority, has clarified this issue. Augmenting and sustaining units were classified as units organized to *train* as units, but not to *serve* as units, as the law requires. Individuals can be called from within these units. In the Naval Reserve, only commissioned units fit the law's "serve as units" definition and even then, recall below unit level can be accomplished, based in specific skills. For example, a well-drilling detachment can be recalled from an engineer battalion.

[4] U.S. forces were dispatched to the Persian Gulf shortly after Saudi Arabia requested security assistance. It was more than two weeks later that the President authorized use of the authority. An unsubstantiated explanation for the delay was that at least one service wanted to exhaust volunteer options before seeking nonvoluntary ones.

[5] If combat were expected, it would not be unreasonable to call units whose mission includes graves registration. Imagine the domestic political upheaval caused by calling such units before the first shot is fired.

[6] *The Washington Post* headline on 23 August stated: "Bush Orders Mobilization of Military Reserves."

[7] Enactment of the authority permits reserve availability within 24 hours of callup, but the inherent bureaucratic delay in getting such a decision staffed up to the President makes the use of volunteers faster, certainly for short-duration calls.

[8] For our purposes, we will take the position that units (or individuals) with specific skills should not be rotated because of loss of continuity. As an example, a unified commander may not want to rotate intelligence personnel every 30 days. The breaks in continuity would result in too much lost efficiency.

[9] The Army used approximately 200 volunteer civil-affairs reservists to aid in restoring government services in Panama. The total Army Reserve civil-affairs community numbers about 5,000.

[10] It is well known that the U.S. public supports military operations once they are undertaken. Sustaining that support over an extended period of time is something else. The U.S. presence in the Persian Gulf came as a result of the Carter Doctrine, which declared events there to be vital to U.S. interests.

Captain Avella is assigned to the Office of the Secretary of Defense. There, he was a member of the crisis management team for Operation Just Cause. He has been recalled to active duty to fulfill similar responsibilities for Operation Desert Shield. Previously, he was the commanding officer of Patrol Squadron Sixty-Six.

Upside Down?

The British Admiralty once issued this order:

"It is necessary for technical reasons that warheads should be stored upside down, with the top at the bottom and the bottom at the top. In order that there may be no doubt as to which is the bottom and which the top, for storage purposes, it will be seen that the bottom of each warhead has been labeled with the word 'top.'"

Herm Albright

Gangway, Regular Marine

Augmentation into the regular Marine Corps is becoming desirable and even more difficult to obtain. Short of gaining a regular commission, many Marine officers who would otherwise prefer military careers must leave the Corps.

During a recent augmentation screening board, the competition was extremely keen. Towards the end of a long, exhausting week of highly competitive interviews, the last candidate appearing before the board was asked the standard question: "Do you have anything else you would like to say to the board?" Without hesitation the young lieutenant replied: "Yes sir . . . I'd just like to say I'll be buying at the club tonight!"

LtCol Gregory Johnson, USMC

DoD News Briefing
Friday, March 15, 1991 - 2:00 p.m.
Mr. Pete Williams, ASD (Public Affairs)
General "Tony" McPeak, USAF

Mr. Williams: Throughout the campaign, throughout the time that Operation Desert Shield and especially Desert Storm were ongoing, our briefings were from the perspective of the overall operation -- from Lt. Gen. Tom Kelly and Admiral McConnell and Captain Herrington, and there have been a lot of requests from you all to go into somewhat more detail about specific parts of the operation. Of course, General Schwarzkopf has given the big view, especially with an emphasis on the ground campaign, but many of you have been interested in a little more detail about how the air part of the campaign was prosecuted. We've been talking to the Air Force about pulling together just such a briefing, and I think it's great for all of us that the guy the Air Force decided to come up with was none other than the Chief of Staff of the Air Force. He's here today to discuss the air campaign with you. He'll have a presentation to make which will last around 20-30 minutes -- it's a very thorough walk-through of exactly how it was all done. When General McPeak is finished with his presentation, he'll then be happy to take your questions for another 20 minutes or so. I imagine the whole operation here will take about an hour.

With that, it's my pleasure to introduce to you all the Chief of Staff of the Air Force, General Tony McPeak.

General McPeak: Thank you, Pete. I'm delighted to be here today to tell an American success story. A great victory achieved against a strong enemy, and with little loss on our part. Before I begin, it is largely a story about air power, a success story for U.S. and coalition air forces. But I need to remind myself and everybody that we were only part of a larger air, land, and sea campaign -- what we call a combined arms operation, in which all of the services made a very important contribution, and, of course, all of our allies as well. I hope you'll forgive me, now, if I talk mostly about the air campaign for the rest of this time, since that's my piece of the thing to talk about. You can bring me back from time to time and remind me that everybody else played an important part.

Iraq invaded Kuwait on the 2nd of August. The President, as you know, subsequently made the decision to intervene. We were given a deployment order on 7 August. We began flying squadrons to the theater immediately. The first squadron arrived in theater in 34 hours. Since 15 of those 34 hours were flying hours for this particular squadron, that meant that squadron launched in less than 20 hours from getting the deployment order here in Washington.

Altogether, about 25 fighter squadrons flew non-stop into the theater. Here I show only a few of the places around the country from which these combat elements came -- by no means all of them here. In all, about 46 percent of the combat force stationed in the United States Air Force, in the continental United States, was deployed. Just a couple of locations of interest here -- we had National Guard units from Syracuse, New York; from South Carolina, McIntyre near Columbia, South Carolina; an Air Force reserve unit, A-10's, from New Orleans, and so forth.

This movement was really made possible by a lot of units not shown here. First of all, all the tankers, the flying gas stations -- we have on the order of 600 tankers in the Air Force. As many as half of them have been involved in this exercise at one time. This was certainly the largest airlift in history. We moved an Army halfway around the world and set it up from scratch. It's really something like moving Oklahoma City, all of its people, all of its vehicles, all of its food, all of its household goods halfway around the world. In essence, we're doing the equivalent of a Berlin Airlift every six weeks -- a magnificent performance, and one only the United States, I think, could have achieved.

The buildup resulted in this kind of a force structure going into the area of operations. Day zero, the 7th of August, the deployment day, the only coalition air forces, fixed wing aircraft that were in place, were the Saudi and Kuwaiti Air Forces. By day five, they had been joined by five U.S. Air force squadrons and some Navy carrier air, and we began to feel a little more relaxed about our ability to defend Saudi Arabia if the Iraqis decided to continue the attack to the south.

In five weeks, we had a pretty good overall air capability, both offensive and defensive. At this point, we outnumbered the Iraqi Air Force. That was about the size of our phase one deployment. It stayed pretty level until the 8th of November when the President directed phase two of the buildup. Between 8 November and D-Day, which was the opening of the air operation, you can see the fixed wing coalition air forces roughly doubled in size. This chart breaks out shooters -- that is to say fighter and bomber aircraft, from support -- tankers, airlift, electronic warfare aircraft and so forth. You will notice that following the beginning of the air campaign and at the start of the ground operation, G-Day, there was an additional increment -- these were other coalition partners that joined after the initiation of hostilities. In the end, by G-Day, when the land operation kicked off, the distribution, the composition of the coalition air force shown here, about half of this was United States Air Force, but the other breakout is shown.

This is a picture that tries to show how prickly this air defense setup was in Iraq. Basically, this is a fairly strong opponent -- the world's fourth largest armed forces and the world's sixth largest air force. As you can see here, on the order of 1,000 aircraft, some of them very good aircraft -- Mirage, F-1's, MIG-29's, Spencers, and so forth -- with a very good infrastructure, widely dispersed around the country. A good offensive capability with both their long range aviation and SCUD missiles, and an air defense setup that can be described, I think, as state of the art. Perhaps as many as 17,000 surface-to-air missiles, on the order of 9,000 to 10,000 anti-aircraft artillery pieces, very modern radars all lashed together with high tech equipment. Lots of computer data links, fiberoptic connections, many of the principal control nodes hardened, buried under concrete bunkers and so forth. This is a first class air defense -- not a featherweight opponent that we had to operate against in the opening hours of the air war.

I want to spend a little bit of time talking about our concept of this operation, and this is going to get a little bit complex, so I apologize in advance. But like the other elements of the air/land/sea campaign, our target was the field army deployed in the Kuwaiti theater of operations. Our mission was to expel that army from Kuwait.

On the air side, our concept really is summarized here. First of all, we knew we needed to operate in Iraqi air space, so he was going to have the home court advantage. We had to penetrate into his territory. To do that, we had to take apart and disrupt his ability to stop us from coming in. In other words, we had to disintegrate his integrated air defense setup. Second, we wanted to make sure that we ourselves, our own forces in Saudi Arabia and elsewhere, did not come under attack by his offensive air threat. We needed to destroy his long range aviation and SCUD missile capability. Taken together, these two steps would give us air superiority.

After we achieved that, we wanted to isolate the Iraqi field army, cut it off from its source of supply and reinforcements, and then to attrit it with the object of wearing it down to the point where when we did intervene on the ground, our ground forces would not have heavy casualties. Finally, at the point where our ground forces intervened, we were prepared to give strong support to our ground operations.

A little further refinement on that would show that our original concept showed the air campaign as being divided into four phases. Phase one lasting about a week, seven to ten days we projected, would be the air superiority phase aimed at destroying Iraqi integrated air defenses and their offensive capability, and disrupting their command and control setup -- attacking the brains and nervous system of the Iraqi ability to control their own forces.

After doing this, we projected that we would turn to the field army deployed in Kuwait, but we felt we'd need a short phase here -- perhaps a day, day and a half -- to suppress surface-to-air defenses in the Kuwaiti theater of operations. This would not be a robust, integrated air defense network, but more the kind that a field army carries with it, mobile systems, and therefore, not near as serious a problem from a strategic standpoint as the integrated Iraqi air defense, so we projected perhaps a day to do that.

The longest phase, phase three, from about the end of the first week until the end of the first month, would be an emphasis on the field army in Kuwait, and we would continue to service these phase one and phase two targets as necessary to keep them down.

Finally, in phase four when our land forces jumped off, we intended to give support to that operation. It turned out, that was the so-called 100 hour war, the four day war from day 39 to 43. As a matter of fact, in the final analysis, G-Day slipped to day 39. So the first phases were not done in 30 days as we originally projected.

This, as I say, was the way we had in mind as a concept at the beginning. I will say this isn't the way it actually worked out. There were some audible calls at the line of scrimmage. One of them was that these phases tended to merge together, and finally did essentially merge together. They merged, really, because the President decided to double our combat force in November, so we had more than enough air power on the scene to do the phase one job at the beginning, and we simply diverted it to begin on phase three. So there was no time from day one on, that the Iraqi ground forces were not under heavy air attack. By the way, this is also something General Schwarzkopf wanted. He was particularly interested in attacking ground forces from day one. In essence, this is his concept of the operation. All pieces of it were his concept, including the air piece. We, naturally, executed according to his concept.

I'll return and talk about some of this other stuff in a second, but I want to talk for just a few moments about the opening minutes of the air war, because they dramatically influenced the outcome of the entire war.

I don't know where you were on the evening of 16 January, here in Washington -- the early morning hours of 17 January in Baghdad. If you were like me, you were home watching TV. CNN reporters in the Rashid Hotel here were out on the balcony reporting that they couldn't see anything up in the sky, and that was an accurate report. The Iraqis were seeing the same thing. They were seeing a situation that we had been showing them since August. AWACS, airborne radar aircraft on our side of the Saudi border, were looking in to keep track of what the Iraqi Air Force was doing. They were accompanied by aircraft in what we call combat air patrols, or CAPs. These are F-15 interceptors up there to protect AWACS and to react to any attack out of Iraq. As I say, these AWACS orbits and these CAP points had been there for months, and something the Iraqis were used to seeing.

Here, General Schwarzkopf exercised a brilliant bit of air deception because south of there, and just beyond the radar warning capabilities of the Iraqi radars, our attack aircraft were forming up in orbits with tankers so that they were able to top off their fuel at the last moment before heading on into the target area.

Here's what was really happening. Our stealth aircraft, low observable aircraft, which these Iraqi radars could not see, jumped off at H-Hour, actually slightly before H-Hour, and blinded the Iraqi early warning system by knocking out these radars, and then proceeded on into Iraq to begin to work on the rest of the strategic targets -- principally the command and control apparatus, the fighter defense direction system, and so forth. They were accompanied, in this instance, by the Tomahawk missiles being fired off by the Navy out here in the Persian Gulf, the so-called T-LAM.

I think we achieved tactical surprise, at least the CNN reporters in the Rashid Hotel were on the balcony reporting that a nearby telecommunications building was being attacked. That also was an accurate report. Having opened up the gateway then, other strike packages rushed through, and we hit very hard -- this was a massive attack in the very beginning moments of the war. We attacked all of the strategic targets that I've spoken of, the electrical power, communications, air defenses and so forth. It was a very heavy attack, very precisely delivered. In my judgment, the Iraqi Air Force never recovered from this opening attack. We took the initiative at the beginning, and we held it throughout the rest of the war period.

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The special role played by the 117 is, I think, worth saying a little more about. Under these triangles, I've marked the locations of the first day targets of the 117's. We didn't have a lot of 117's in theater. As you can see, they are only 2.5 percent of the force that we deployed there. They attacked 31 percent of the targets that were attacked on day one. As you can see, they did all the work -- they and the T-LAMs -- did all the work in the heavily-defended downtown Baghdad area. They also attacked key parts of the air defense system throughout Iraq.

This is the 117, you've seen it. It's been operational now for nearly 10 years. It still represents the state of the art as far as operationally fielded technology. As far as we know, it's never been tracked by any Iraqi radar. It has certainly never been touched by bullets or SAMs or anything else. We operated for 43 days with this aircraft completely invulnerable, so far as we know. As it says, never touched by target defenses.

I want to make a little more on this point here, because with the combination of stealth and precision attack capability in the 117, we were able to attack targets very discretely. We did not carpet bomb downtown Baghdad. As a matter of fact, it's obvious to anyone who has been watching on television, the pictures of Baghdad neighborhoods untouched, people driving around, walking around on the sidewalks and so forth. We took special care to make sure that we attacked only military targets, and we attacked them quite precisely. Air crews were informed to bring home the ordnance if they weren't sure they were locked to the right targets. We made very few mistakes. I'm quite proud of the fact that we achieved high levels of destruction against military targets with minimum collateral damage.

As I say, there were several audibles called. Things didn't proceed precisely according to our pre-canned script, as I talked about the merging of the phases. This is, perhaps, the thing that hurt us the worst. This was certainly the poorest weather in 14 years in the Baghdad and Kuwait area. I say 14 years, because we in the Air Force only have 14 years of good climatological data. Maybe this is the worst weather in 100 years, for all we know. It was at least twice as bad as predicted. As a consequence, we lost a lot of targets, especially to the 117, where low cloud cover prevented them from acquiring the target, and they simply brought the munitions home.

Another factor which was different than expected was the amount of effort we put on chasing SCUDs and the way we had to improvise and figure out how to handle the SCUD problem. We thought from the beginning that we would have to attack SCUDs. What surprised us was we put about three times the effort that we thought we would on this job. Of course, we attacked the known SCUD, fixed SCUD firing positions. The SCUD is a missile that flies to a known range. Its range can't be regulated after it's fired. If you were going to attack Haifa or Tel Aviv, we can draw a circle and we know about from where you have to launch it, or if you were going to attack Riyadh or Dhahran, we know where those launch locations are. So we went there and attacked the positions that had obviously been set up as fixed positions, but that wasn't enough. Mobile SCUD launchers operated at night, drove into these launch boxes and launched, so we had to do a lot of road wrecking, even with the A-10's. An old, slow aircraft was used to go out where we could do this and run up and down the road and try to find these mobile launchers.

Probably the most effective thing we did was to put F-15E's in airborne CAPs right overhead of these SCUD launch boxes, and then use JSTARS, which is an airborne radar system now under development -- it isn't really fielded yet, but it's in engineering development. This radar finds and tracks moving targets on the ground. So with it, we could track all of these vehicles. When we found one that looked suspicious, then these JSTAR aircraft were able to divert these airborne CAPs and perform on the spot, ad lib attacks.

Being in one of these CAPs is roughly the same as flying from Washington to Chicago, going into an airborne orbit for three hours, conducting a precision attack, and then flying back to Washington, D.C. -- a tough job for some of these guys, but they did it very well.

I'm going to show you some of the results here from our SCUD attacks. First, starting with the attacks on fixed launch sites. This is a fixed site. We can tell because of the layout here of the launcher, and then this trenching coming out to generating power and other utility support for the site. These are relatively straight forward, easy first attacks, because we knew where they were. Here's an F-15E attacking a fixed site. Here's another fixed site with the trenching, being attacked by an F-15E.

We also attacked SCUD storage. This is a SCUD storage bunker. We know that because of the configuration of the roads leading in and out. The weapon goes in the top, and we get a big secondary explosion as you can see. Obviously, there were SCUDs inside.

This is a mobile SCUD launcher. They even started hiding the mobile launchers in culverts along the highway, as you see here, so we had to go attack the culverts to get underneath them.

Altogether, using all of these various combination of means, improvising and so forth, I think we had a pretty good impact on SCUD launchers. As you see, the SCUD average launch was five a day for the first ten days. I show here in black, the SCUDs launched on Israel. They had a heavy launch rate here. In gray, the launches into Saudi Arabia. This first ten day launch rate of about five a day was cut down in the last month to about one a day. But really, there was an even more profound impact than that, because out in this area they began launching SCUDs from out of the boxes. We had driven them out of the boxes so they no longer could launch as many on Riyadh and Tel Aviv -- in other words, urban targets. Some of these were actually launched against military targets -- for instance, King Khalid Military City was attacked in the north part of Saudi Arabia. We forced them to improvise, and we sharply reduced the number of launches they could make through a combination of these tactics.

Skipping to the end, throughout the entire 43 days, the coalition air forces put up about 110,000 sorties. As shown here, the U.S. Air Force flew nearly 60 percent of that total. We dropped about 88,500 tons of ordnance. Again, the U.S. Air Force contribution was major.

This one is of particular interest to me, because in my judgment it was the precision munitions that did the most important work. As you see, the U.S. Air Force did about 90 percent of that. It might interest you to know that this is about half again as much tonnage as we dropped through the entire war in Vietnam. It 43 days, in other words, we far exceeded our tonnage of precision-guided munitions in a war that lasted eight or nine years.

I want to talk a little bit about the Iraqi Air Force. Here, I talk about shooters -- in other words, fighter and bomber sorties that they flew, and other sorties -- support, transport, and so forth. The convention here is to say this is the number of sorties the Iraqi Air Force was flying in the first two weeks in January before the war began. You can see, they were flying about 100 sorties a day, almost 60 of which were shooter sorties. This is the day of the war out to G-day, day 39, and the final ceasefire here, on day 43. Notice that they put up a pretty good flight here for the first two or three days. The first day in particular, they had a lot of support sorties. On day three, they gathered themselves together and put up quite a few fighter sorties.

After that, this effort really wasn't very good. It was markedly down from what they were doing here in peacetime. It looked to us as though they stood down on the ninth day of the war. These clumps here -- this one and this big clump -- are the flights to Iran. Essentially, it looks as though the Iraqi Air Force gave up at this point and went to Iran. Then the entire effort went brain dead for about two weeks. Finally, here on G-day, day 39, we had two more flights. These also were flights out to Iran.

I want to talk specifically about flights to Iran. These were the ones that we tracked. Support aircraft, transports mostly, as you can see, went out in the first week or so of the war. Here's the day nine stand-down, and these are the two big groups of flights to Iran, and then the final flight out with the last two aircraft.

What happened is that about day seven we decided to attack Iraqi aircraft in their aircraft shelters. I think they made a decision that since they were no longer safe in shelters, that they would have to leave. Then they started out to Iran. Right in here, we put an air CAP along the Iranian border and began intercepting aircraft coming out of Iraqi airspace and into Iran, so they quit going to Iran. Here we pulled that airborne CAP down because it looked to us as though they had stopped going to Iran, and they went back at it again. They were playing kind of a cat and mouse game here. As I say, that was essentially the end of the story.

Q: All those are one way trips?
A: Yes, these to Iran are one way trips.

Here is our aerial victory, a total of 35 aerial victories were scored by all the coalition air forces -- the U.S. Air Force shot down 31 of those 35. As you can see, we had a fairly good fight on our hands, not real good, but at least some kind of a fight for the first three days. We got half of our kills in the first three days. Then these groups of kills here were registered against aircraft fleeing to Iran.

Q: Does this include the helicopters?
A: No, fixed wing only, as it says.

This summarizes the Iraqi Air Force attrition: 122 aircraft flown to Iran -- in other words, most of these aircraft out of the fight, went to Iran. Here's our 35 air-to-air kills. Other kills, these are aircraft destroyed on the ground; some accidents they had -- some of these including aircraft that were crashed trying to fly to Iran; and some aircraft captured by our ground forces during the ground campaign.

I said they had about 600 shelters. We attacked the majority of them. We estimate there were a large number of aircraft inside these shelters, but these are not counted as confirmed kills. Our confirmed total aircraft out of the fight, 234.

I want to show some more film here about attacks against the Iraqi Air Force, beginning with aircraft in the open. This is a Soviet bomber design, called the Badger, sitting in a revettment. We are lasing with a laser-guided bomb. Next is a Soviet fighter called the Fitter, again, in the open -- we're lasing it. Now we go against aircraft shelters, I'm sure you've seen footage like this, or quite similar to it. This is an aircraft shelter. I show it because it's such a dramatic explosion that we know there was something in that shelter. Here we have debris coming out both ends of that particular shelter. Here's another attack with a large secondary coming out the top. Finally, when we got on the ground, we captured some Iraqi airfields.

Here's an aircraft shelter, we're taking the picture out the side of a helicopter. Here's a shelter that looks undamaged, but you'll see an entry wound on the side. Here's another shelter essentially blown apart. We landed on the ground at this airdrome and walked in and looked at one. Here's the roof of one of the shelters. It shows the bomb entry point. We will pan to the floor of the shelter. The bomb penetrated the floor, heaved the floor up, as you can see, and of course, destroyed the aircraft inside.

Once we had achieved air superiority, our next goal was to cut off the deployed field army. As the Chairman said, Colin Powell said, first we're going to cut it off, and then we're going to kill it. Part of cutting it off was to destroy the Iraqi ability to supply and reinforce that army down in the Kuwait theater of operation.

During the course of this, we tracked 54 major bridges. Some were important to us because they were on the road system out through the launch boxes for SCUDs and we wanted to prevent movement of mobile SCUDs. But most were important to prevent the reinforcement of the deployed firled army.

Now I'd like to show a little film footage of bridge action. Some of this is quite famoud film footage, particularly the first one. This first one shows a pickup truck, the little white dot here, driving on to the bridge. WE missed the truckon this one. As you can see, we're lasing out here. The next one shows a lot of traffic on the bridge -- it shows how important these LOC's were. There's a bus that we missed, but the truck right behind him gets in the way of this laser-guided bomb. This is a pontoon bridge. Once we had destroyed the major bridges, the Iraqis threw across pontoon bridges, and we went after them also.

Finally, after we had cut off the field-deployed Iraqi Army, we went to work on major categories of equipment. You see here our estimates of how many tanks were in the Kuwaiti theater of operations, in the large black bar; how many other armored vehicles; how much artillery. Here, the estimate on G-Day, the official estimate of what we had destroyed by G-Day, by the time the ground forces started moving, and the current official estimate. My point is, I believe strongly that we were very conservative in our claims. Once we actually did push in on the ground, it was obvious that we had achieved destruction rates well above something like the 50 percent we may have been claiming in all classes of major equipment.

I'll show you one last film clip which shows the attack of Kuwaiti equipment in the field. We'll begin with F-111's using laser-guided bombs against tanks. You'll see large chunks of armor come out there as the tank is blown apart. Here's another attack against tanks. This is a spectacular one because of the ammunition and fuel and so forth inside the tank. This is an attack on a convoy. You see the hot spots along the road -- those are tanks in a convoy. Here's one burning as the A-10, in this case, works against this tank with a Maverick missile. The tanks tried to get off the road. You can see them leaving the road now and driving out into the desert. In fact, some of the tankers tried to run away -- you see the people running away. Of course we continued to attack. This is a moving tank, moving it into the desert off the road. We continued to attack him. We got a pretty good sized secondary on that one. As I say, I think we achieved very large levels of destruction prior to G-Day, and I'm convinced that made the job a lot easier for our ground forces.

I spoke of JSTARS earlier, it's an airborne system that tracks moving targets on the ground. This is a picture of the JSTARS radar showing moving vehicles. This is not a typical day in Kuwait, although this is Kuwait City, because this is after the ground forces intervened, and this is the retreat of the vehicles up the major arteries to the north. This is what I think Secretary Cheney called "the mother of all retreats."

Let's talk about our losses. We had low losses, but we had some losses. Here we show that the U.S. Air Force lost 14 aircraft in combat, and some others through non-combat causes. That's a number I regret, I don't like losing 14 aircraft, but it's one aircraft every three days or so of combat, and no one would have ever believed that we would lose only one aircraft every three days. The other losses are coalition partners and the Marines and the Navy.

One more word on casualties. CENTAF is the Air Force's part of Central Command. As of the latest official figures yesterday, we had three killed in this whole operation. We're still tracking three missing, and we won't be happy until, as the President says, until we get a full accounting of that. These 14 missing are also Air Force personnel. They were aboard a special operations gunship.

One other point, in two separate instances, the United States Air Force attacked friendly vehicles. We destroyed both of those vehicles, and we killed 13 of our own people -- Marines in one case, and Brits in another. That's two separate mistakes that we made. We attacked probably something on the order of 10,000 vehicles. These mistakes were made in the fog of combat, heavy fighting on the ground. They were both done at night -- it's a very difficult problem, to do this kind of thing at night. We certainly deeply regret this kind of thing. It's a problem we work on all the time. I feel badly about it. My only consolation is by the grace of God and dint of hard work, perhaps we saved a few who might otherwise have been claimed.

Q: General, there was also a report of Marines who died in...
A: I'll take your questions in just a second.

Let me finish by talking about the lessons we learned in this business. Perhaps it's better to say relearned, because some of these are old lessons. First of all, talk about great leadership -- our President is batting 1,000 on this thing, and 300 will get you in the Hall of Fame. With him, Secretary Cheney and the Chairman, I think you got really an all star cast there. And I've got my team in case we have to go again against anybody. On the scene, Norm Schwarzkopf. Very few field commanders have ever mastered the art of more than one form of warfare. He's proved himself to be the absolute master of both sea, air, and ground warfare. His name joins that very short list of true, brilliant American generals. By the way, his airman, Chuck Horner -- a guy I've known since we were lieutenants together -- always has known his business and proved it again. As the architect of the air war and the guy who executed it Schwarzkopf's concept of air operations, he did a magnificent job.

The U.S. Air Force can go anywhere in the world very quickly, and it have tremendous destructive effect when ordered to do that by the President. It is important that we had one concept of operations -- General Schwarzkopf's concept -- for the air, land, and sea campaign. It was very important they all marched to the same set of orders. Air superiority once again proved it's importance. Our flexibility to improvise, make up tactics, and so forth, were very important.

Stealth, in combination with precision-guided munitions, I think, has certainly the potential to revolutionize warfare.

Probably the most important lesson, we have quality people that are well trained, that are very confident, and they proved it.

This is meant to be a little bit of humor. I want to say a word or two about the Iraqi Air Force. I think they did rather well under the circumstances. They're a pretty good outfit. They happened to be the second best air force in the fracas. Having the second best air force is like having the second best poker hand -- it's often the best strategy to fold early. I think they folded early. The lesson for us is we do not want ever to enter combat with the second best air force.

That's it, ladies and gentlemen. I'd be willing to take your questions.

Q: Since you say they folded early, is there enough of an element left there to worry about? Do you feel prepared to start up an air war again with the forces you have on the ground, given the troubles that are now in Iraq, and the fact that troops are now starting to come home?
A: In my judgment, it will be a generation before the Iraqi Air Force recovers to anything like its previous strength -- at least a generation. That doesn't mean they won't be capable of isolated air action. They can't begin the building process right away, and so forth, but their infrastructure is heavily damaged. Their airfields, their maintenance facilities, their operational facilities, their aircraft shelters. Their aircraft are gone. The ones that are surviving are mostly out of the country. A generation of pilots and crew chiefs and mechanics and air leaders have certainly vanished. I think it will be a long time before they constitute a significant threat again.

Q: What about your assessment of what we have on the ground now?
A: We're in great shape.

Q: Could you start up an air war again if it's necessary?
A: We have aircraft on orbit right now, flying there, who can do whatever General Schwarzkopf and the President ask it to do.

Q: When you say the F-117 was 2.5 percent of the air asset, is that the bombers?
A: The shooters. Two and a half percent of the shooters.

Q: Can you assess the contribution that Navy aviation made to the war, and whether their planes brought something to it the Air Force didn't have, or whether it was basically redundant?
A: They made a tremendous contribution. It was not redundant. They were tremendously effective in everything they did. The CNO may brief you on that one of these days. I'm just absolutely delighted we worked together with the Navy as partners in the coalition air force.

Q: Late in the war you were continuing to strike targets in Baghdad. Reviewing the map, it looked like 900 to 1,000 sorties a day against strategic targets. Can you give us some sense of breaking down the strategic targets, and what kind of things were you still hitting in Baghdad weeks into the war?
A: We were not flying 900 sorties a day late in the war against strategic targets. Beyond that, I think I'll duck the rest of the question.

Q: Can you give us any sense of what percentage of laser-guided bombs hit their targets?
A: I don't have any good data on that. If I had to give you a guess, I would say on the order of 90 percent.

Q: You were talking about taking out the bridges. Did you take out every bridge over the Euphrates?
A: No, we did not.

Q: How many did you take out, and why did you leave some standing?

A: We took out very nearly all. As you see, we had about [40] out of the 50-odd that we were tracking that were in the water at the end of the time. They didn't get them all. It only lasted 33 days, and we really didn't start on bridges until about day seven to ten.

Q: It looked like the RAF was doing a hell of a job on the bridges...
A: The RAF did a first class job on everything they tried to do. It was an honor to be involved with them in this effort.

Q: At the end of the ground war, the Army was saying that going after the Iraqi soldiers was sort of like clubbing baby seals. At this point, the Air Force also swooped in on one of the convoys going from Kuwait into Iraq, was that an excessive use of violence? Number two, what about Iraq's use of combat, fixed wing aircraft now flying in Iraq from place to place? Are you concerned about that?
A: I'm not sure there is any fixed wing flying -- combat aircraft flying today in Iraq.

Q: the last few days.
A: No, I don't think there have been any, but I really ought to tell you to direct that to Riyadh.

Q: If there were, would you be concerned about that?
A: Yes, I would. But my level of concern would depend on the circumstances -- how many, what direction were they going, that sort of thing. So it's a tactical judgment that should be made on the spot.

As far as attacking retreating troops, I think you have to understand a little bit about military history. When enemy armies are defeated, they retreat, often in disorder, and we have what is known in the business as the exploitation phase. It's during this phase that the true fruits of victory are achieved from combat, when the enemy's disorganized. The alternative is we should never attack a disorganized enemy. We should wait until he is stopped, dug in, and prepared to receive the attack. You may recall how disappointed Lincoln was with General Meade when he failed to pursue Lee south after Gettysburg. It certainly prolonged the Civil War perhaps a year or so, and many more young northern and southern men were killed as a consequence. All American generals should remember that lesson. If we do not exploit victory, then the President should get himself some new generals.

Q: But you don't see the pictures of that as looking like excessive use of violence?
A: That is exactly what happens when a rout occurs, and the enemy retreats. It's a tough business, but our obligation is to our own people, and our obligation is to end the war quickly in the most humane way possible. It often causes us to do very brutal things -- that's the nature of war.

Q: Can you give us more details on the B-52 operations? Is there a judgment that more aircraft were needed, and what led you to conduct those operations from great distances?
A: B-52 operations can be conducted from great distances, and we did that. I'm not sure I understand your question.

Q: I understand that additional B-52's were called in at later phases. Can you give us some details on when that occurred and why those judgments were made? How many aircraft were...

A: After the opening of combat operations, some of our coalition partners agreed to allow us to conduct operations. That accounts for the growth of the shooter and support aircraft from D-Day to G-Day. We had the capability to operate those aircraft, and we did.

Q: Going back to an earlier question about targeting soldiers, one of your primary targets that you mentioned were the Iraqi ground forces throughout the theater. Could you tell us what considerations, if any, were given to either trying to kill as many of these soldiers or not kill them, what kinds of munitions were used? Could you have wrought even more destruction than you did, say by use of Napalm or other types of weapons? Explain a bit of the decision-making process of that and the impact it had on human life.

A: This is a tough business, so I don't want to exaggerate the length to which we went to try to keep from killing people. But we did drop leaflets and so forth. We made it clear that our targets were equipment targets. We said in our leaflets that were dropped, move away from your equipment, you'll be safer. We said we will not attack anybody walking north, and we didn't. We attacked equipment in every case. So I think we tried to disarm the Iraqi Army as humanely as possible.

Q: Could you elaborate a little bit on the point at which the Iraqi aircraft began going to Iran, and was that the result of some precision bombing by stealth aircraft? Second, do you know if we captured any SCUD missiles in the areas occupied by allied forces?

A: On the second one, I do not know that. Again, I think General Schwarzkopf would be the right guy to take the question. I believe that after about day seven when we stepped up our attacks on aircraft shelters, that a decision was made by the Iraqi Air Force that they had to leave in order to survive. In the first two or three days of the war, we made it obvious that with a ratio of 35 to 0 in the air, they couldn't survive in the air. But we also subsequently made it clear they couldn't survive by staying parked in the aircraft shelters, and that's the point at which I think they decided to leave.

Q: Can you tell us what the F-117's, what targets they hit in Kuwait City, and did that occur right at H-Hour?

A: The targets in general were aimed at air defense operation centers, communications, command and control.

Q: General Horner in Riyadh, said the one aircraft that he most could have used in this campaign was the B-2 stealth bomber. Given the utter collapse of Iraqi radar defenses and the relative impunity with which we were flying, do you agree or disagree with General Horner's yearnings for the B-2? Would the B-2 have made any difference?

A: I think the B-2 will make a tremendous difference when fielded. The principal difference will be its reach. In other words, with the B-2, we'd have a stealthy aircraft roughly equivalent in signatures to the F-117, although a huge airplane -- that shows you how far stealth technology has come in the last 10 years. This aircraft will have stealthy characteristics, but be able to go from CONUS secure operating bases, and with one refueling, reach any part of the earth. So of course it would have had some value in the a situation like Iraq. But for my money, the principal value would be to take conventional weapons long distances and attack very quickly whenever the President decides to do that.

Q: These JSTARS that can identify mobile targets, could they identify them well enough to distinguish between a truck that might have a SCUD and a Jordanian oil tanker? Or are they just identifying large moving targets?

A: I can't answer the question. I'm not sure.

Q: You went into the war thinking how many of your aircraft were going to be shot down. When you take a look at the overall picture, you flew 60 percent of the sorties, but only 30 percent of the planes were (inaudible). Why did the Air Force do better than the others? Was there any fratricide in the air? Did the allies shoot down any other planes?
A: Quite frankly, I thought our losses would be somewhat higher. I projected in the deliberations leading up to the decision, that we might lose as many as four or five aircraft a day. My private hunch that I sort of had in my hip pocket was less than that, but you know air power advocates over the years have gotten themselves in trouble by bragging too much about what we're going to do, so I tried to nudge that and add a little fudge factor in there. But I certainly, even in my most optimistic, wildest dreams, would not have said we would lose one aircraft every three days in this kind of an operation.

U.S. Air Force losses were gratifyingly low. I can't offer any explanation for that. We do have the world's only operational stealth airplane, and since it wasn't scratched, why it tended to skew the results in our favor. But all of the services did extraordinarily well -- the Marines, the Navy, the allied air forces. This was a first class operation. Having said that, am I proud of the performance turned in by the United States Air Force? You bet.

There was no case of blue on blue fratricide any time during the war. I've already talked about our air-to-ground fratricide, but no air-to-air fratricide. It's remarkable, when you think we were putting 3,000 sorties a day up there or more. It is a tribute to General Schwarzkopf's single concept of the operation, management of it centrally, and everybody singing off the same sheet of music. A remarkable performance.

Q: Given the level of damage that the air war alone inflicted on the Iraqis, and the fact that by the time the ground war started there was the rendering through television mini-vans and pilotless reconnaissance planes, is it conceivable that by continuing the air war alone for another period, the Iraqis would have been totally defeated without a ground war?
A: My private conviction is that this is the first time in history that a field army has been defeated by air power. It's a remarkable performance by the coalition air forces. But there are some things air power can do and does do very well, and some things it can't do, and we should never expect it to do very well -- that is to move in on the terrain and dictate terms to the enemy. Our ground forces did that. I think, by the way, again, they did a remarkable job. First, we weren't so sure we were making the right move when our ground forces, the 25th Mech and the armored divisions up there in contact with the Republican Guard stopped and offered, really, a merciful clemency to the Iraqi ground forces. But that's the kind of thing ground forces can do, and I think they did a magnificent job.

Q: You said at the beginning that Iraqi had the sixth largest air force, and you said they were not a featherweight opponent, and yet by day nine they were practically out of business. I'd like you to explain whether, besides the precision weapons and all that, was morale over there so bad, were the planes so bad, the pilots, did they over-estimate their own air power? What happened?
A: I think they picked the wrong time to lean on President Bush. The ultimate answer to that question is, this is not the right time to pick on the United States. What we have here is armed forces -- Air Force, Navy, Marines, ground forces, that have had a decade of reasonably good funding -- good O&M funding so that we've had

good flying hour programs, good steaming hours for our Navy, good maneuver training for our land forces. So they just ran into a buzz saw. It's not that they were featherweight opponents, it's just that they picked on the wrong guy.

In my judgment, only the United States Air Force could have disintegrated that air defense system as quickly as we did with such overwhelming shock power that it totally stunned the Iraqi Air Force, and in essence, the issue was decided in the first few hours of the engagement.

Q: What does this tell you about Soviet equipment, Soviet doctrine, Soviet tactics? If you were the Chief of Staff of the Soviet Air Force, what would you tell your boss?

A: The commander of the Soviet Air Force is, for the first time in living memory, younger than the Chief of Staff of the United States Air Force, and I've read some of his writings -- he's a very interesting guy. I think he sees a need to change the way the Russian Air Force operates. So I would say good luck to him. It may well be that he's right on that one.

Q: Can you tell us besides the F-117 and the F-15E, what were some of the new weapons that you used in this war that hadn't been used before, and can you tell us, did you use any cruise missiles?

A: I don't have at my fingertips a good answer. We did employ some precision, especially precision-guided munitions that we hadn't used before. One thinks of the Tomahawk immediately. The munition used by the F-117 is a case-hardened 2,000 pound bomb that we have not used before. But no, I don't think there were a lot of strange, new munitions. Most of our air-to-air kills were achieved by the Sparrow missile we used in Vietnam, 20 years old or older -- a product-improved version of it.

Q: Did you use any Air Force cruise missiles?

A: I can't help you with that problem.

Q: What about AWACS? There was an awful lot of air traffic in the air. How were they successful? What were some of the reasons for their success in sorting out and maintaining that air traffic?

A: That's their mission. They're a highly capable system. They handle large numbers of air targets. They do that routinely, all the time. The people on board the airplane are highly trained, and the radar is very good, so it performs well.

Q: It's been widely reported that rotary wing aircraft and other forces participated in those first few hours of attack against the early warning system, and I wonder if you could help us get a more integrated picture of how they fit into those crucial few hours.

A: I can't help you on that.

Q: I wonder if you could talk about reserve forces. What did they contribute, and what would your assessment be of their performance and their readiness?

A: On the air side, the reserve forces did a magnificent job. The Syracuse Guard unit, Hancock Field, boys from Syracuse, were over there, back from a very rugged air base, turned in a magnificent performance. So did the McIntyre F-16 outfit, and the New Orleans Guard. We also had some reconnaissance help from RF-4C units -- Reno Guard. Much of our airlift was performed by Guard and Reserve forces, and a lot of the aerial tanker force. So in general, they were ready when called on, they were moved immediately, and they were employed the minute combat began, so that argues that they're highly trained and ready to go, and I'm very proud of their performance.

Q: Can you give any kind of percentage, like the percentage of sorties that they flew? Second, if your reserve forces were so ready and so useful, what could other services learn from that? What is the reason that they were?
A: I think it's an easier problem for the Air Force, because the nature of our mission means that it's one that experienced people, pilots, for instance, can serve a tour in the Air Force, get out, go find a job as a pilot in civilian life, and join a National Guard or Reserve unit, so they continue to polish their flying skills. It's not exactly the same as some other combat skills that other services may have to train for. In any case, whatever the reason, the total force policy works for the Air Force, and we're very proud of their performance.

Q: You described a 30-day air war as what you had initially expected.
A: No. Through phase three, and then that would be followed up by the land part, in which we would do phase four air support.

Q: Okay, but as it turned out, you went a full 39 days before passing to the ground war, and you cited a couple of reasons. Were they the only reasons, or was progress overall a little bit slower than you had anticipated?
A: I believe we made the progress about on schedule. General Schwarzkopf is the one that said we will attack on day 39. He set the timing on that. He could have done it on day 30, or he could have waited until day 46. For him, weather was a big consideration, too, because weather has an impact on land force operations. In any case, he picked the right day. We had some obstacles to overcome. As I say, the principle one was very bad weather. We worked around it and we worked around the diversion of a significant portion of our combat power on the SCUD problem. But I think it's kind of coincidental that G-Day was day 39 instead of day 30.

Mr. Williams: General, thank you very much.

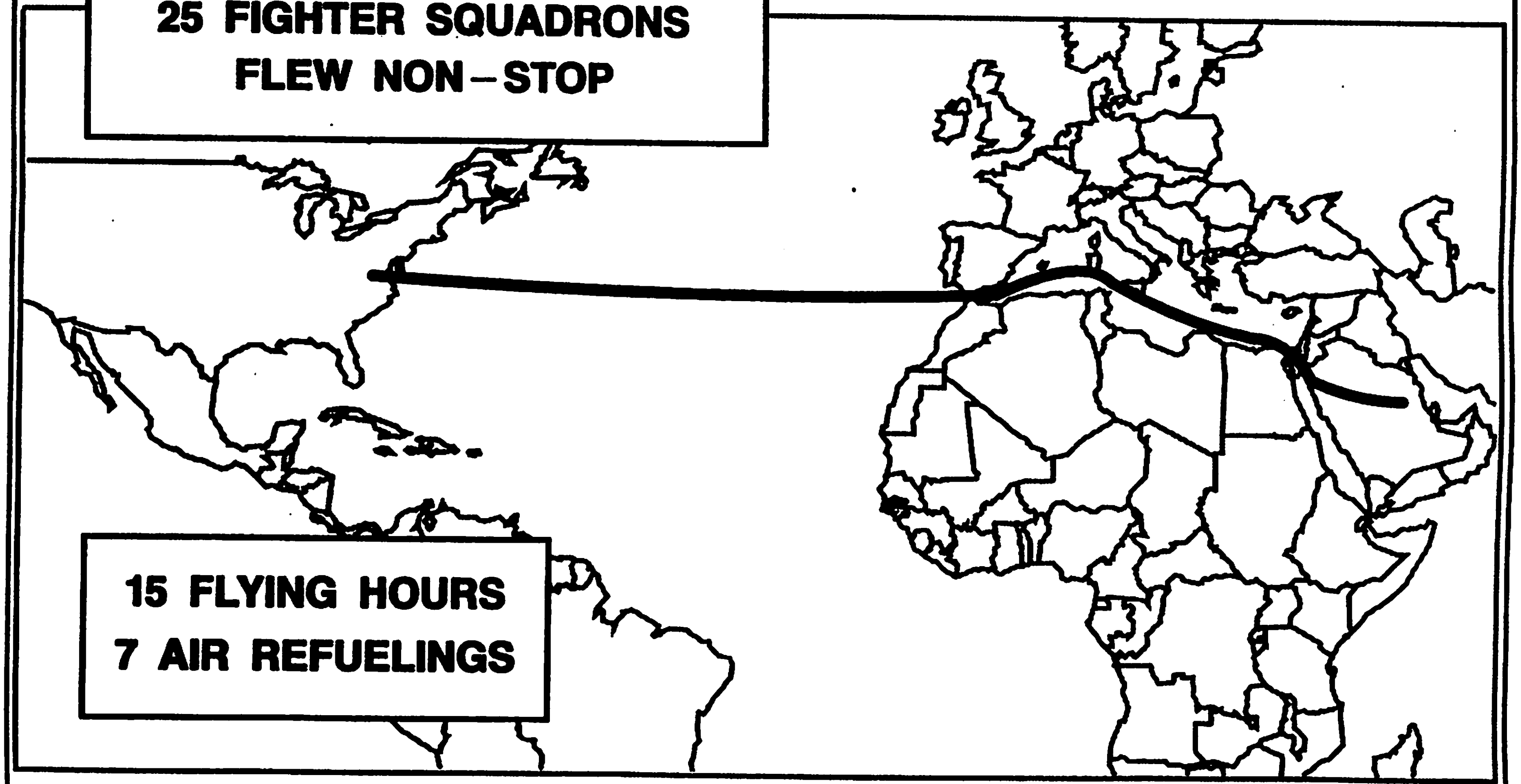
END

CHIEF OF STAFF
UNITED STATES AIR FORCE

THE AIR CAMPAIGN:
PART OF THE COMBINED ARMS OPERATION
- OR -
"THE MOTHER OF ALL BRIEFINGS"

GENERAL MERRILL McPEAK
CHIEF OF STAFF

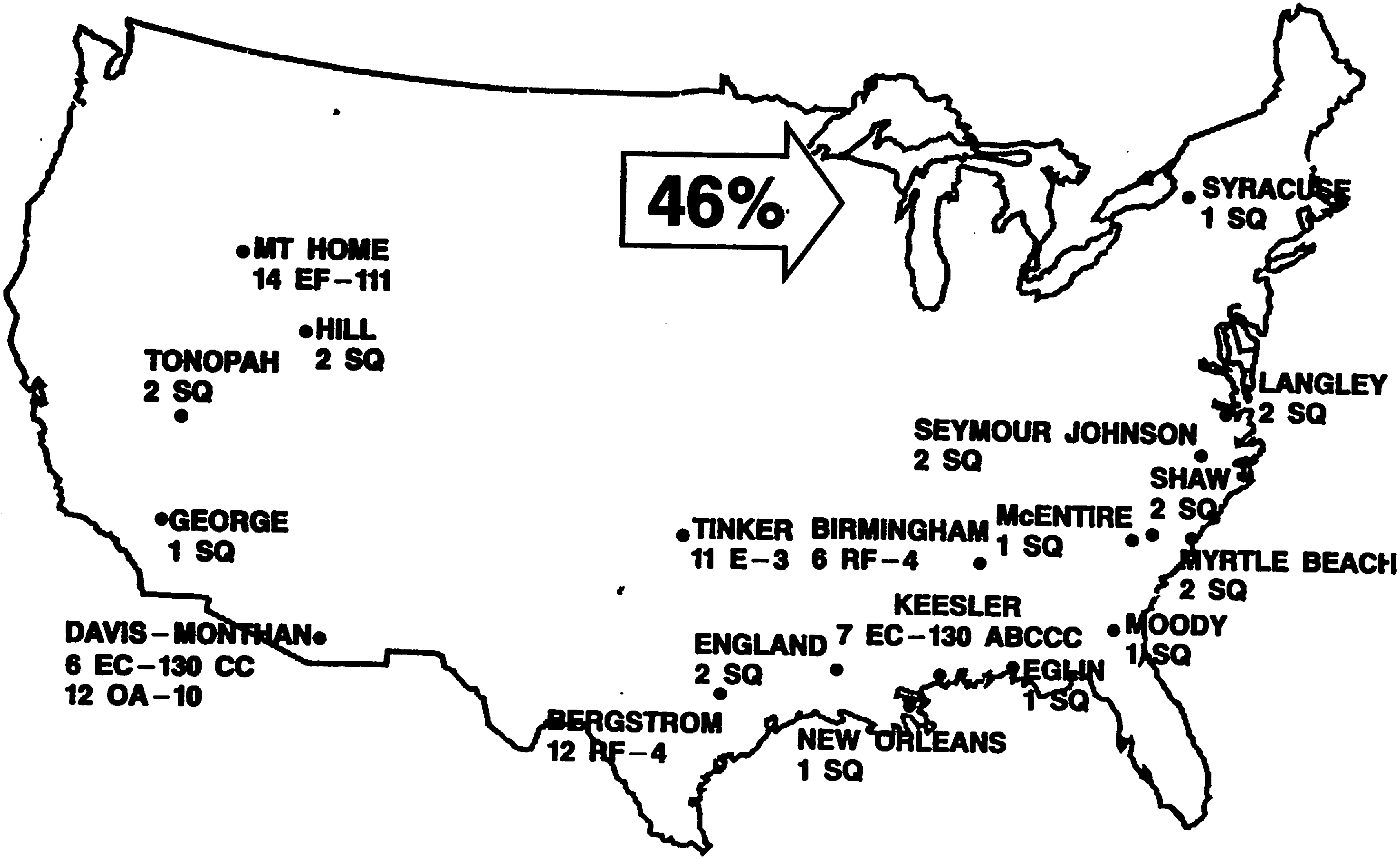
DESERT SHIELD DEPLOYMENT



25 FIGHTER SQUADRONS
FLEW NON-STOP

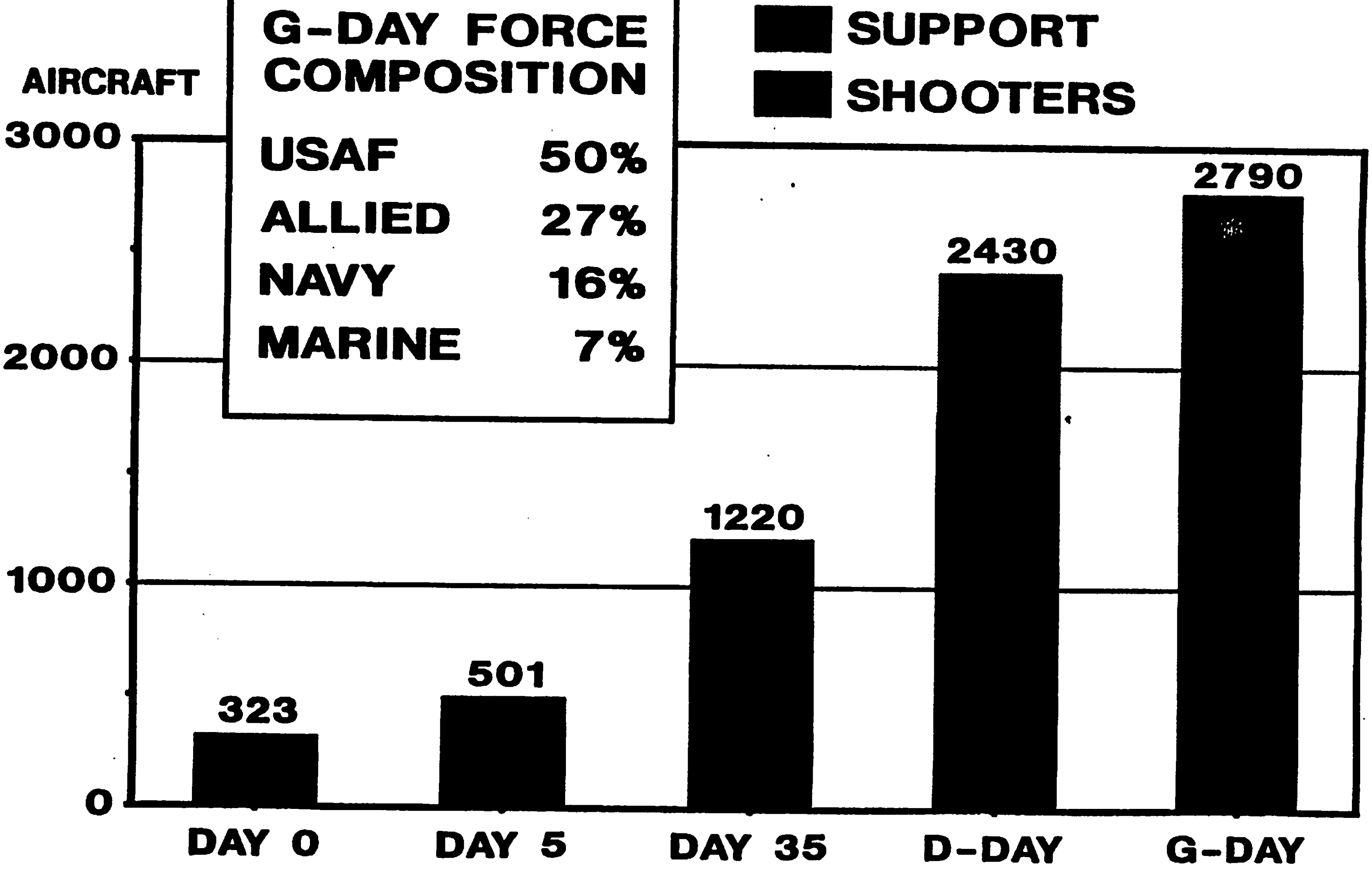
15 FLYING HOURS
7 AIR REFUELINGS

COMBAT UNITS IN DESERT SHIELD



DESERT SHIELD COALITION AIR POWER

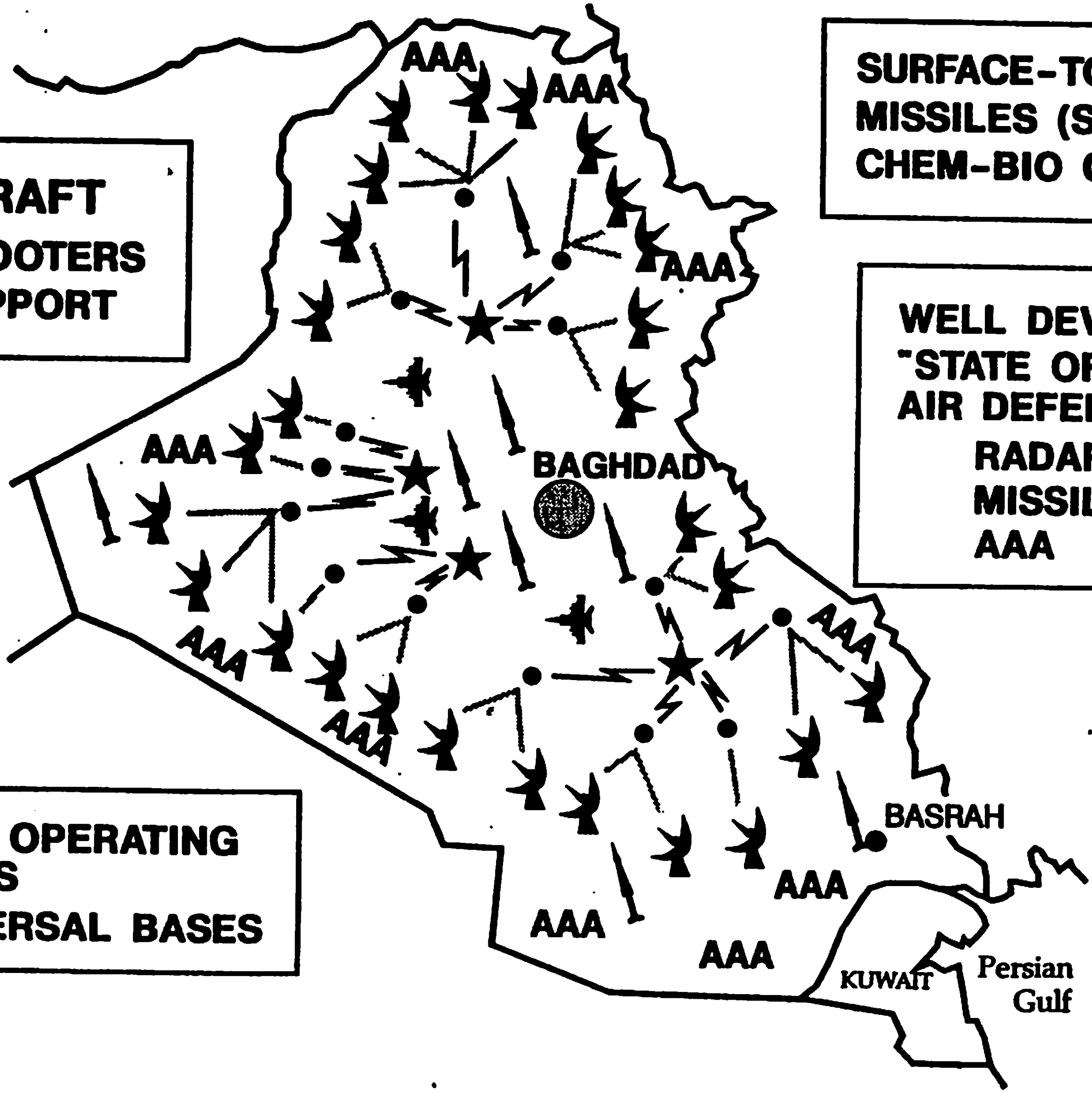
(FIXED WING)



G-DAY FORCE COMPOSITION

USAF	50%
ALLIED	27%
NAVY	16%
MARINE	7%

IRAQI AIR THREAT



AIRCRAFT
750 SHOOTERS
200 SUPPORT

24 MAIN OPERATING BASES
30 DISPERSAL BASES

SURFACE-TO-SURFACE MISSILES (SCUD)
CHEM-BIO CAPABILITY

WELL DEVELOPED "STATE OF THE ART" AIR DEFENSES
- RADARS
- MISSILES
- AAA

THE AIR CAMPAIGN

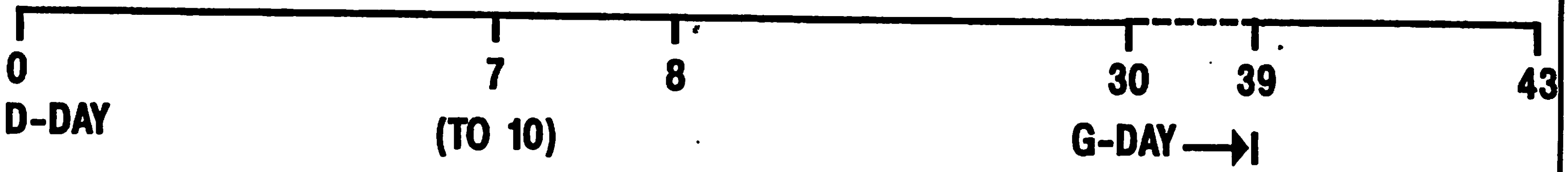
- **TARGET:** FIELD ARMY DEPLOYED TO KTO
- **MISSION:** EXPEL FROM KUWAIT
- **CONCEPT:**
  - PREVENT IRAQI DISRUPTION OF ALLIED AIR OPS
  - DESTROY IRAQI OFFENSIVE AIR THREAT
  - ISOLATE AND ATTRIT THE FIELD ARMY
  - SUPPORT ALLIED GROUND FORCE OPERATIONS

CONCEPT OF THE AIR CAMPAIGN

PHASE I	*PHASE II*	*PHASE III*	*PHASE IV*
GAIN AIR SUPERIORITY DESTROY IRAQI STRATEGIC CAPABILITY • NUCLEAR, BIOLOGICAL, CHEMICAL • SCUDS DISRUPT IRAQI COMMAND AND CONTROL	SUPPRESS AIR DEFENSES IN KTO	CONTINUE TO SERVICE PHASE I & II TARGETS AS NEEDED SHIFT EMPHASIS TO THE FIELD ARMY IN KTO	AIR SUPPORT OF GROUND OPERATIONS

PROJECTED DAYS TO COMPLETE

"100 HOUR WAR"



0 D-DAY

7 (TO 10)

8

30

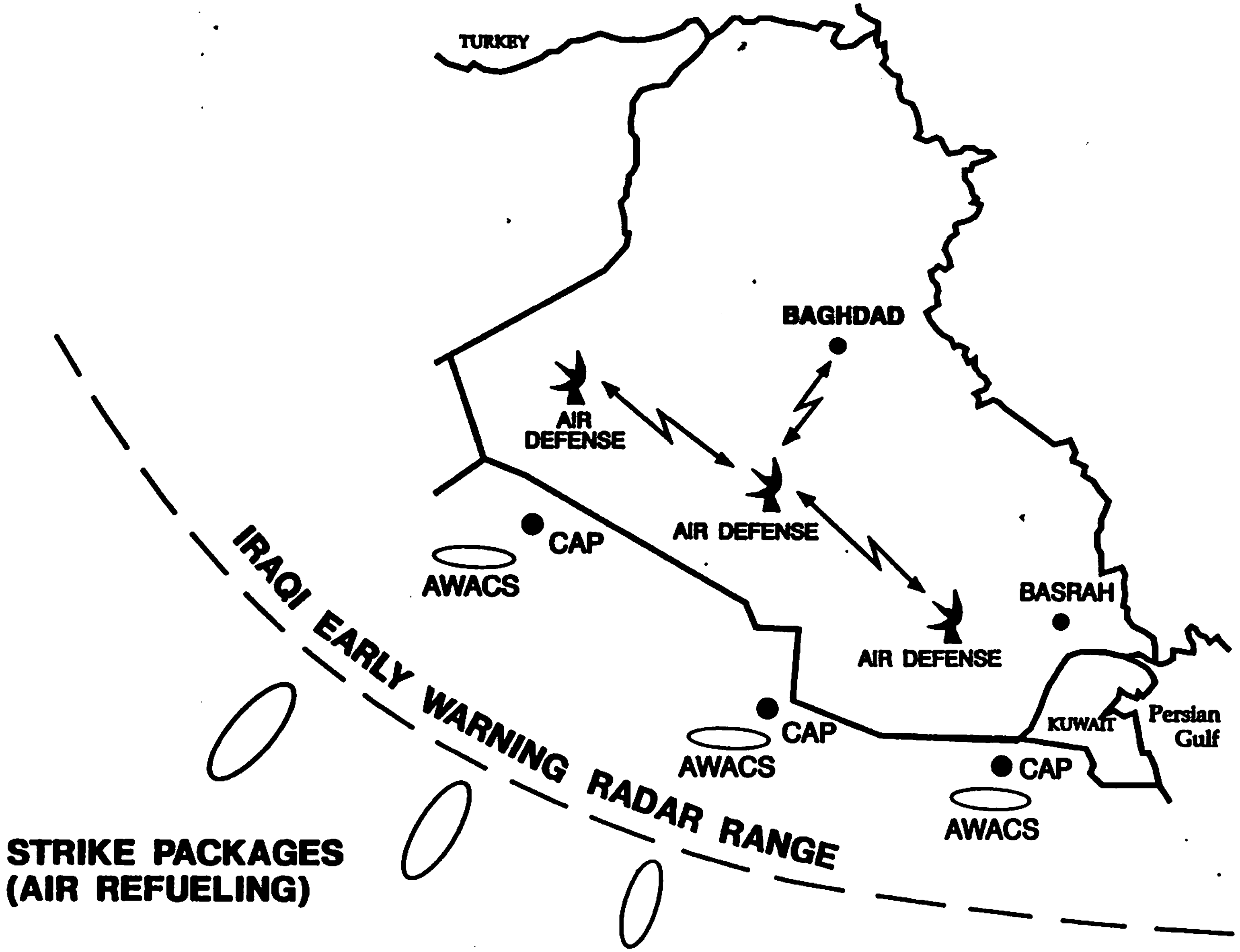
39 G-DAY →|

43

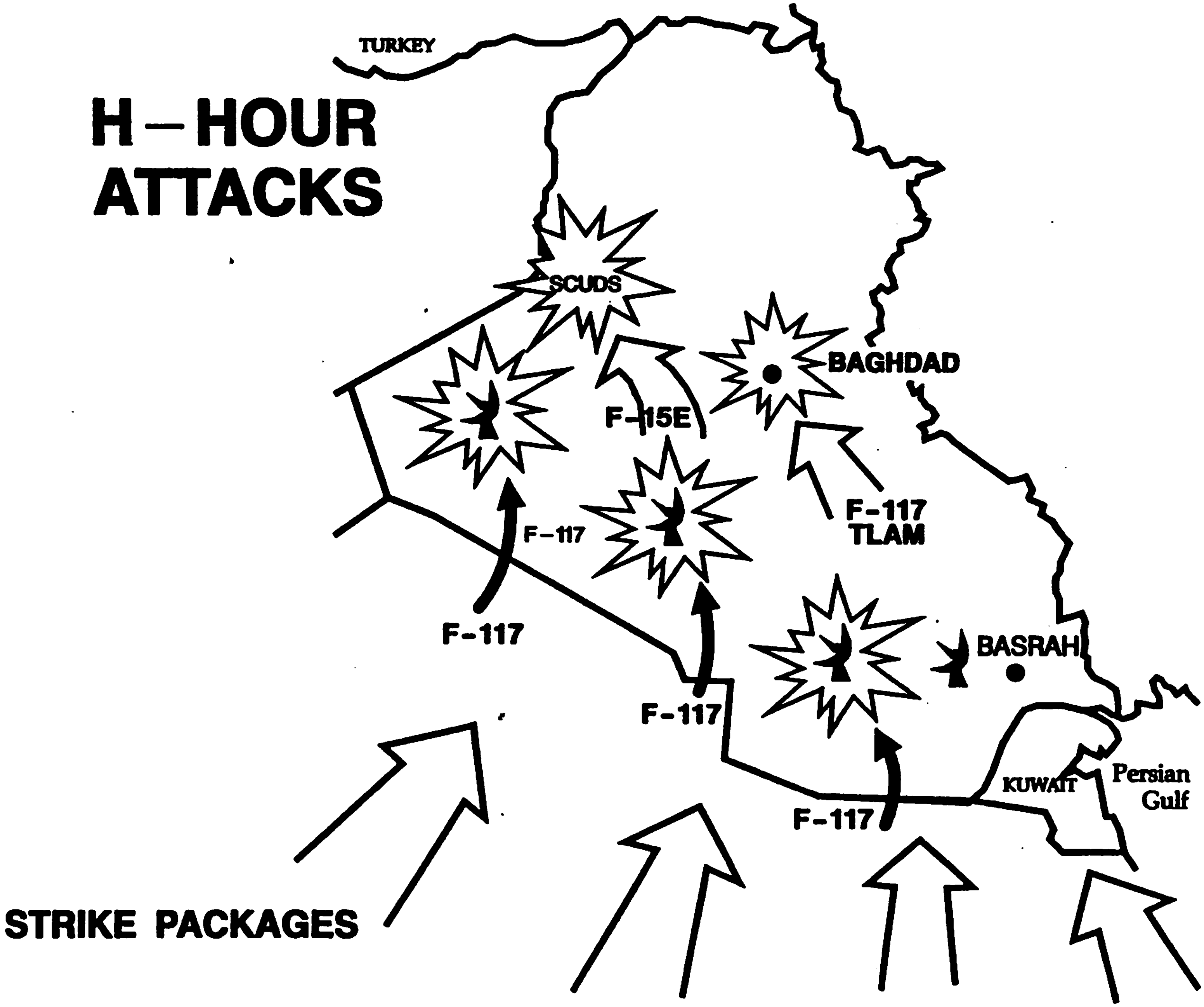
AUDIBLES

- MERGING OF PHASES
- VERY BAD WEATHER
- THE GREAT SCUD CHASE

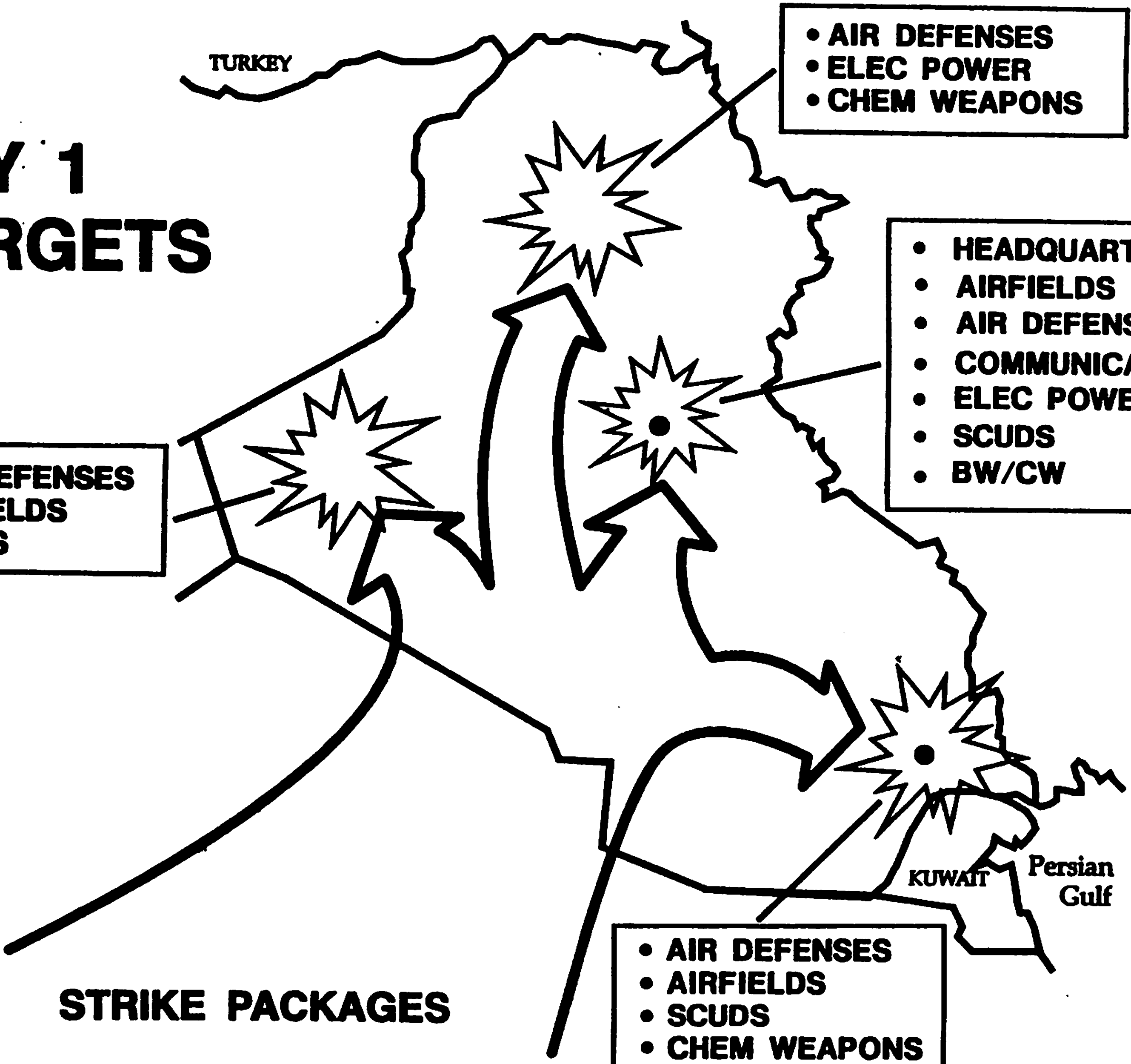
IRAQI PICTURE (BEFORE H-HOUR)



H-HOUR ATTACKS



DAY 1 TARGETS



- AIR DEFENSES
- ELEC POWER
- CHEM WEAPONS

- HEADQUARTERS
- AIRFIELDS
- AIR DEFENSES
- COMMUNICATIONS
- ELEC POWER
- SCUDS
- BW/CW

- AIR DEFENSES
- AIRFIELDS
- SCUDS

- AIR DEFENSES
- AIRFIELDS
- SCUDS
- CHEM WEAPONS
- HEADQUARTERS

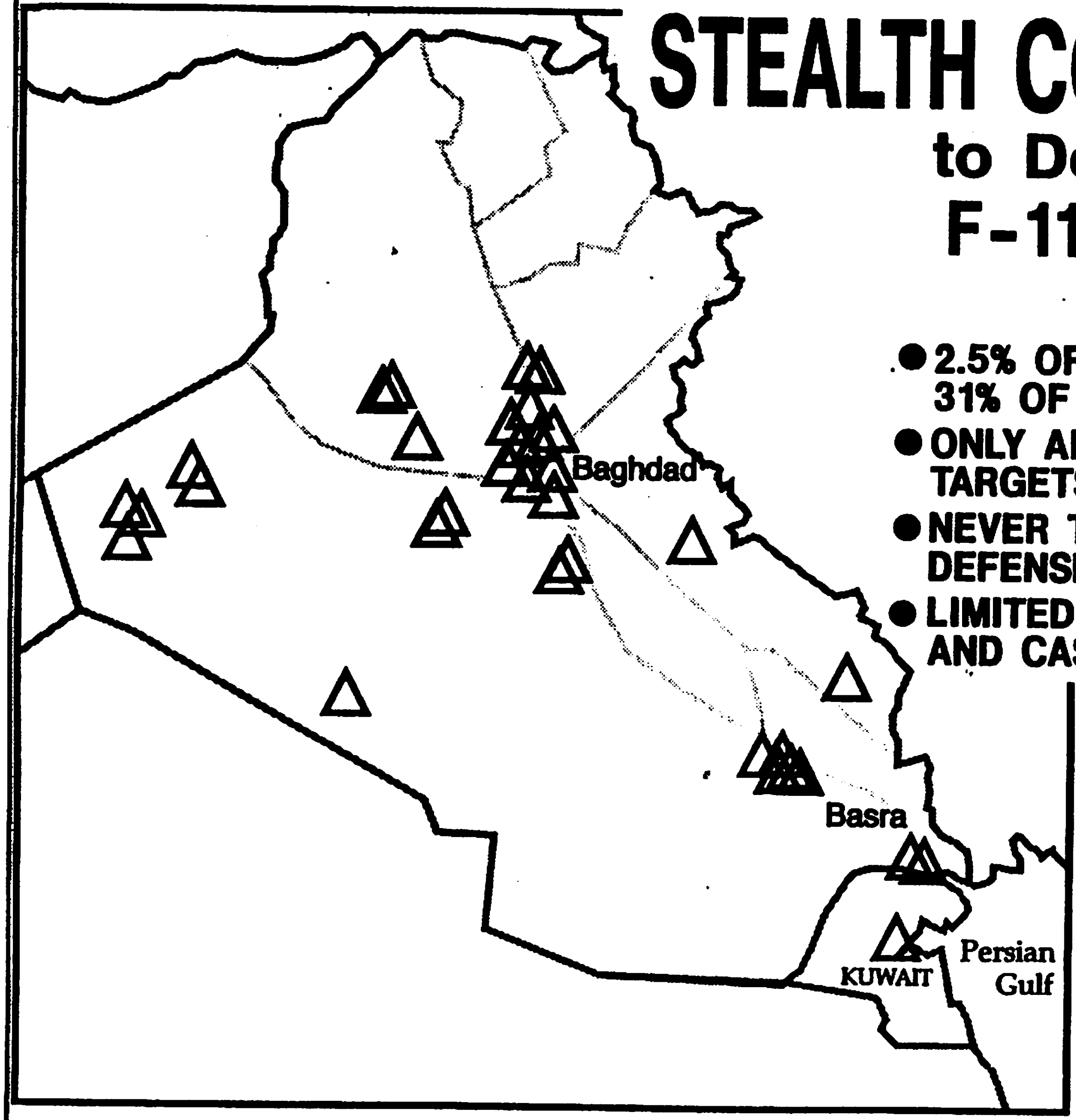
STRIKE PACKAGES

STEALTH CONTRIBUTION

to Desert Storm

F-117 TARGETS

(DAY 1)

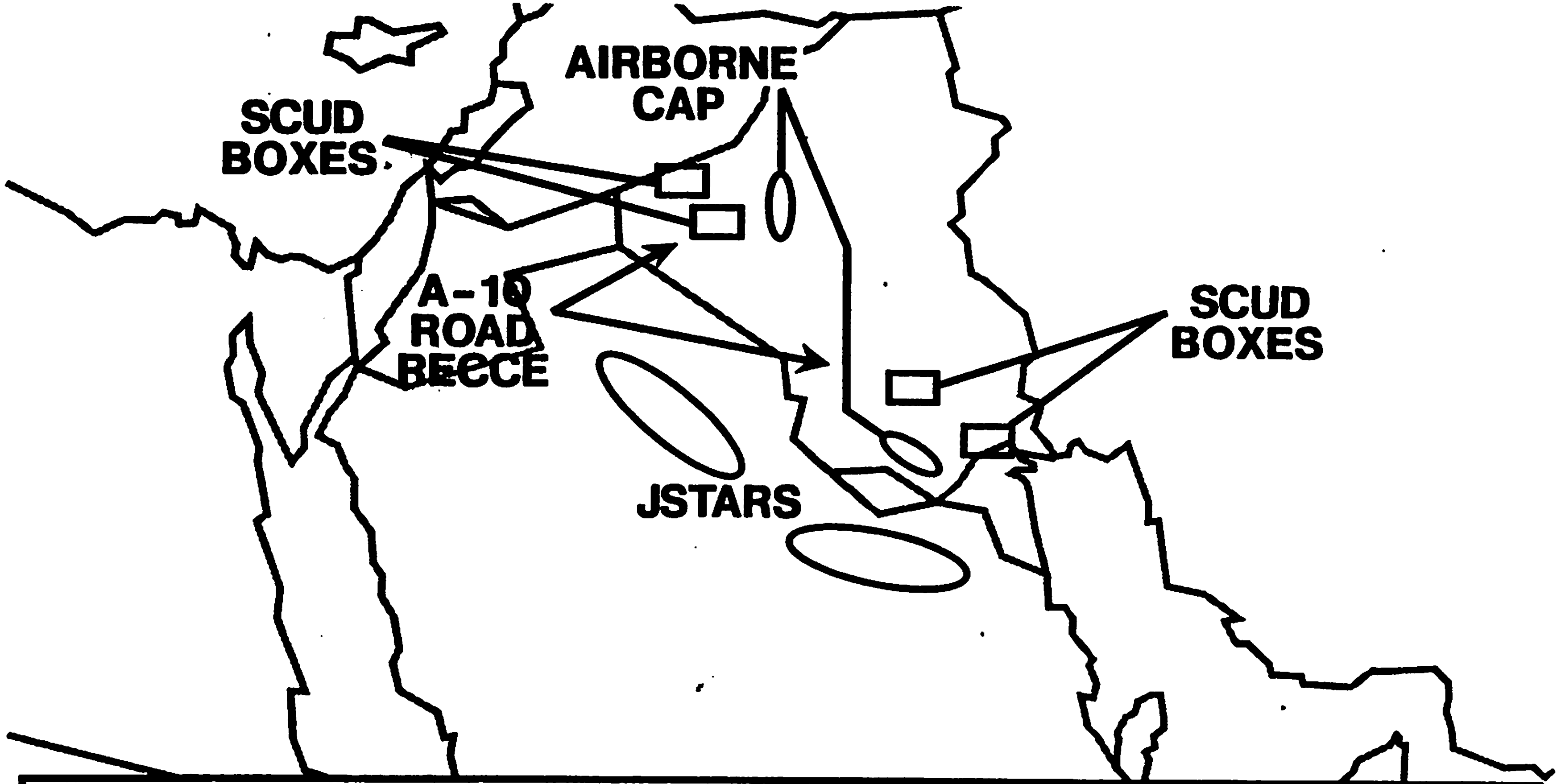


- 2.5% OF FORCE ATTACKED 31% OF DAY 1 TARGETS
- ONLY AIRCRAFT TO ATTACK TARGETS IN DOWNTOWN BAGHDAD
- NEVER TOUCHED BY TARGET DEFENSES
- LIMITED COLLATERAL DAMAGE AND CASUALTIES

AUDIBLES

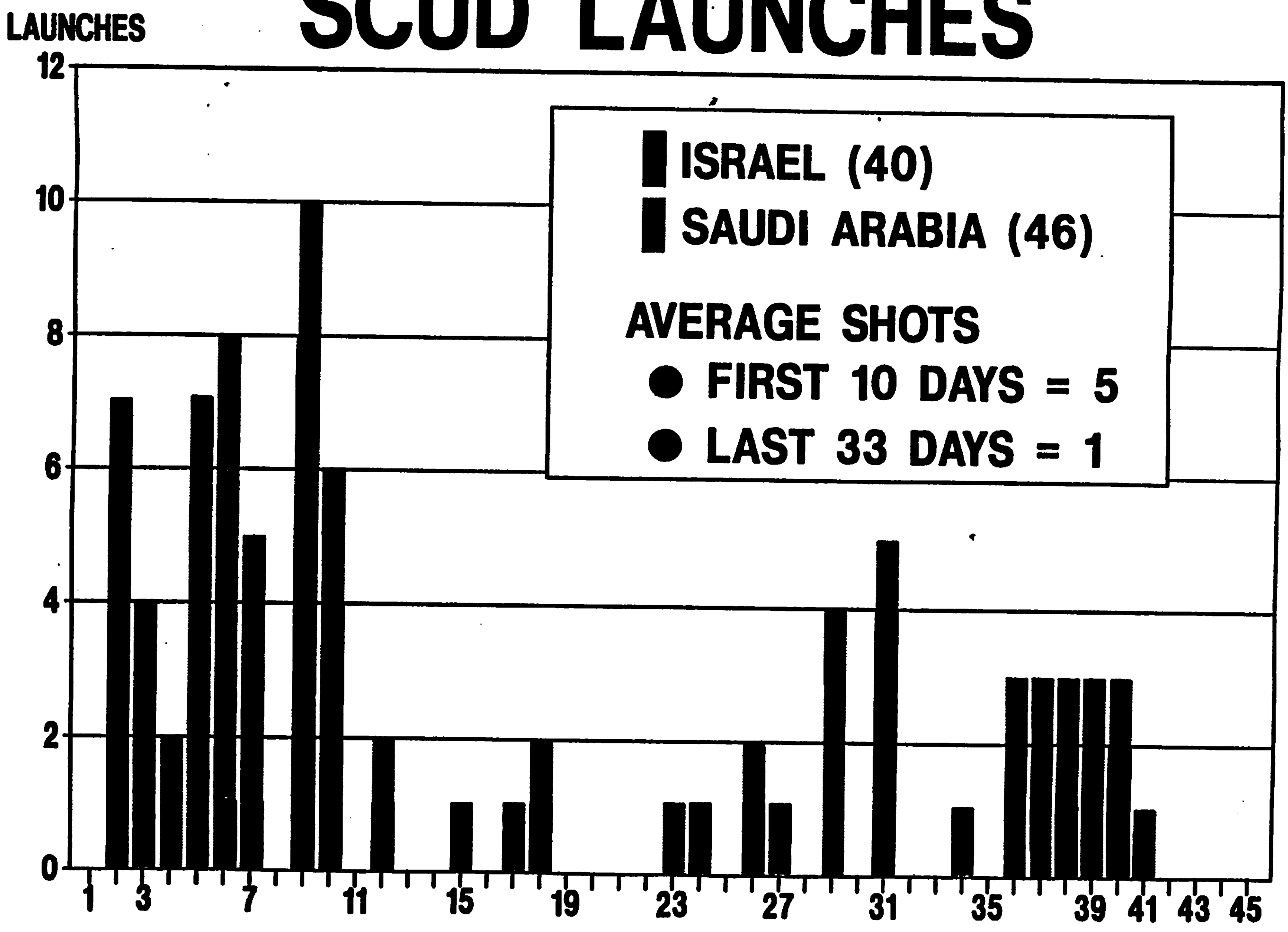
- MERGING OF PHASES
- WORST WEATHER IN 14 YEARS
  - LOW CLOUDS PREDICTED 18% OF TIME
  - ACTUAL 39%
  - LOST 40% OF PRIMARY TARGETS, FIRST 10 DAYS
- THE GREAT SCUD CHASE
  - GREATER IMPACT THAN EXPECTED
  - IMPROVISED TO FIND BEST TACTICS AND FORCE MIX

OPERATIONAL PROCEDURES FOR SCUD CHASING



- FIGHTER AIRCRAFT IN AIRBORNE ORBIT
- A-10 ROAD RECCE
- QUEUING ACCOMPLISHED BY JSTARS, ETC.

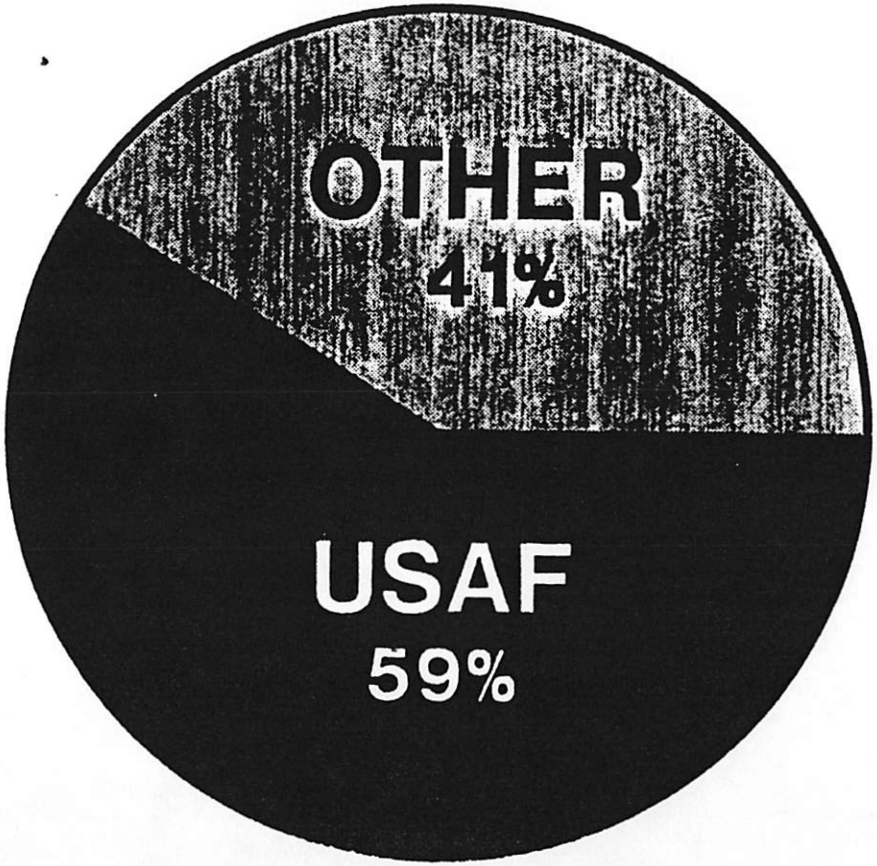
SCUD LAUNCHES



AVERAGE SHOTS

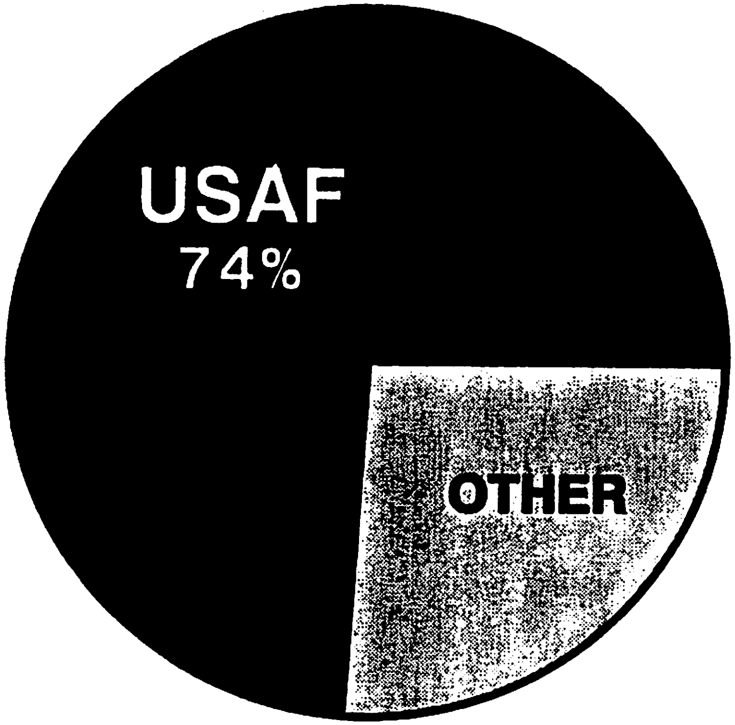
- ● FIRST 10 DAYS = 5
- ● LAST 33 DAYS = 1

AIR EFFORT FROM D-DAY TO CEASE FIRE

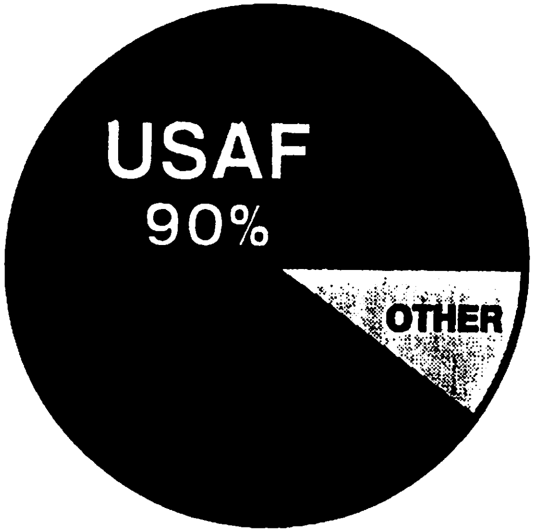


TOTAL SORTIES = 109,876

TONNAGE EXPENDED
US – ONLY

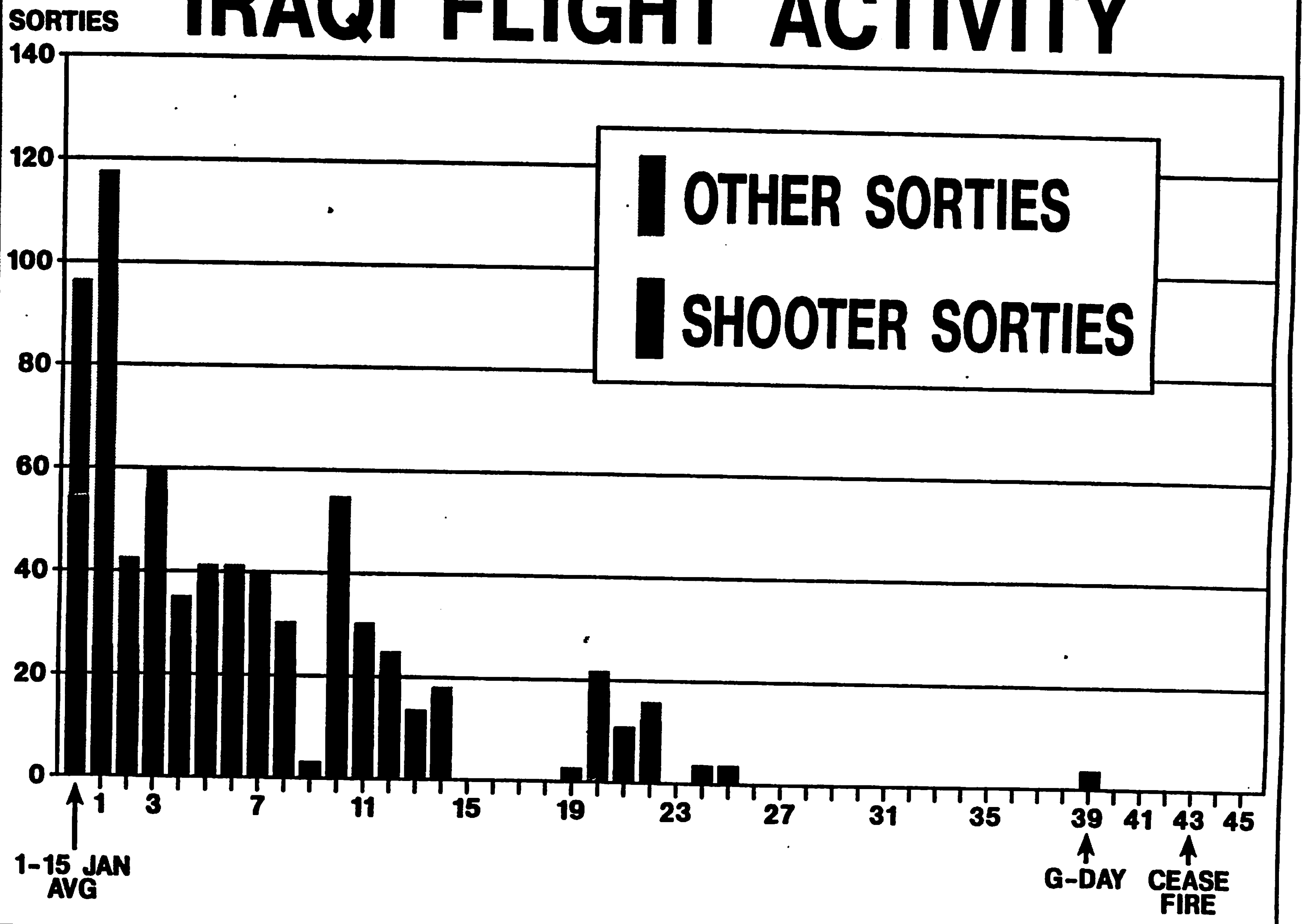


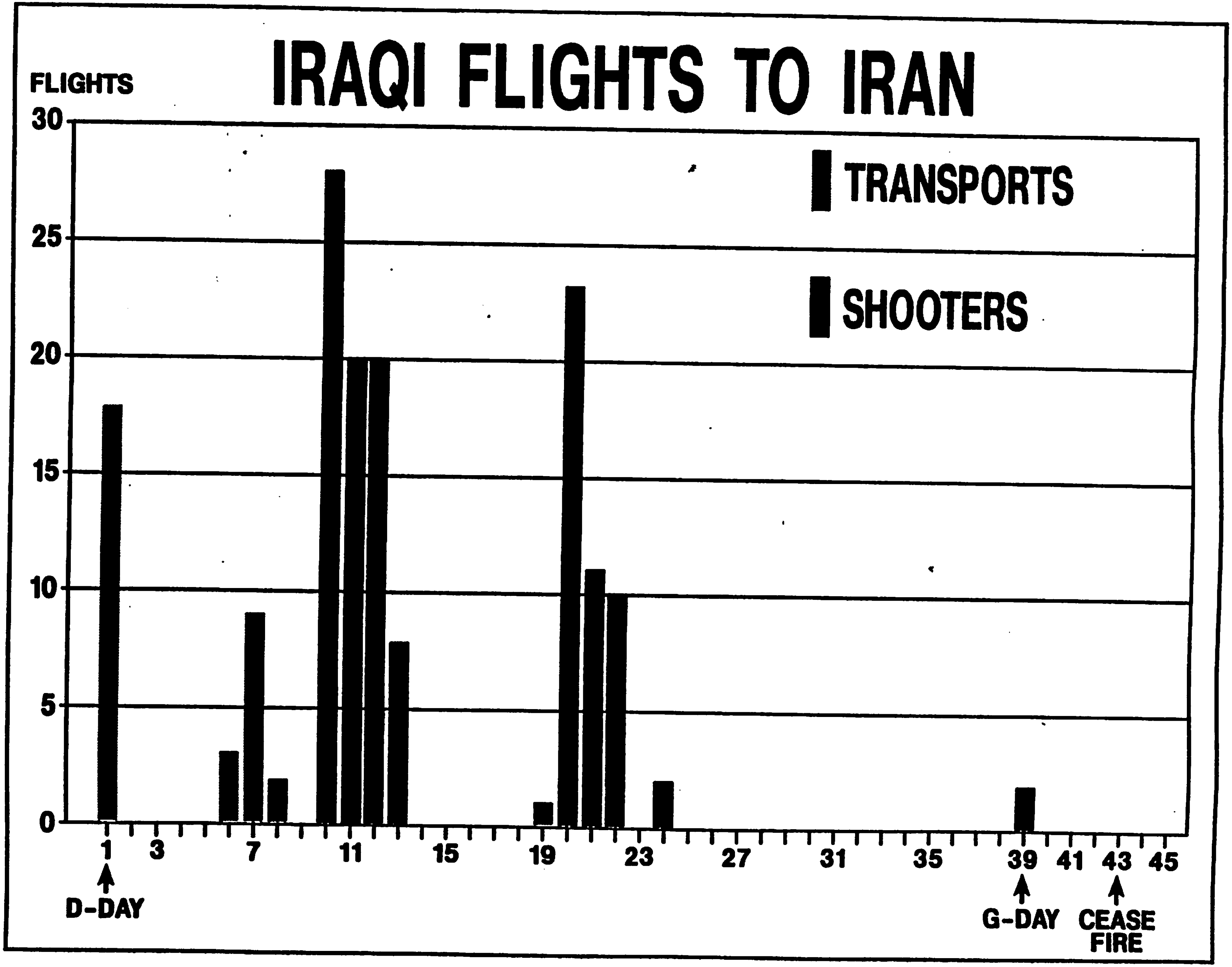
TOTAL TONNAGE
88,500



PRECISION TONNAGE
6,520

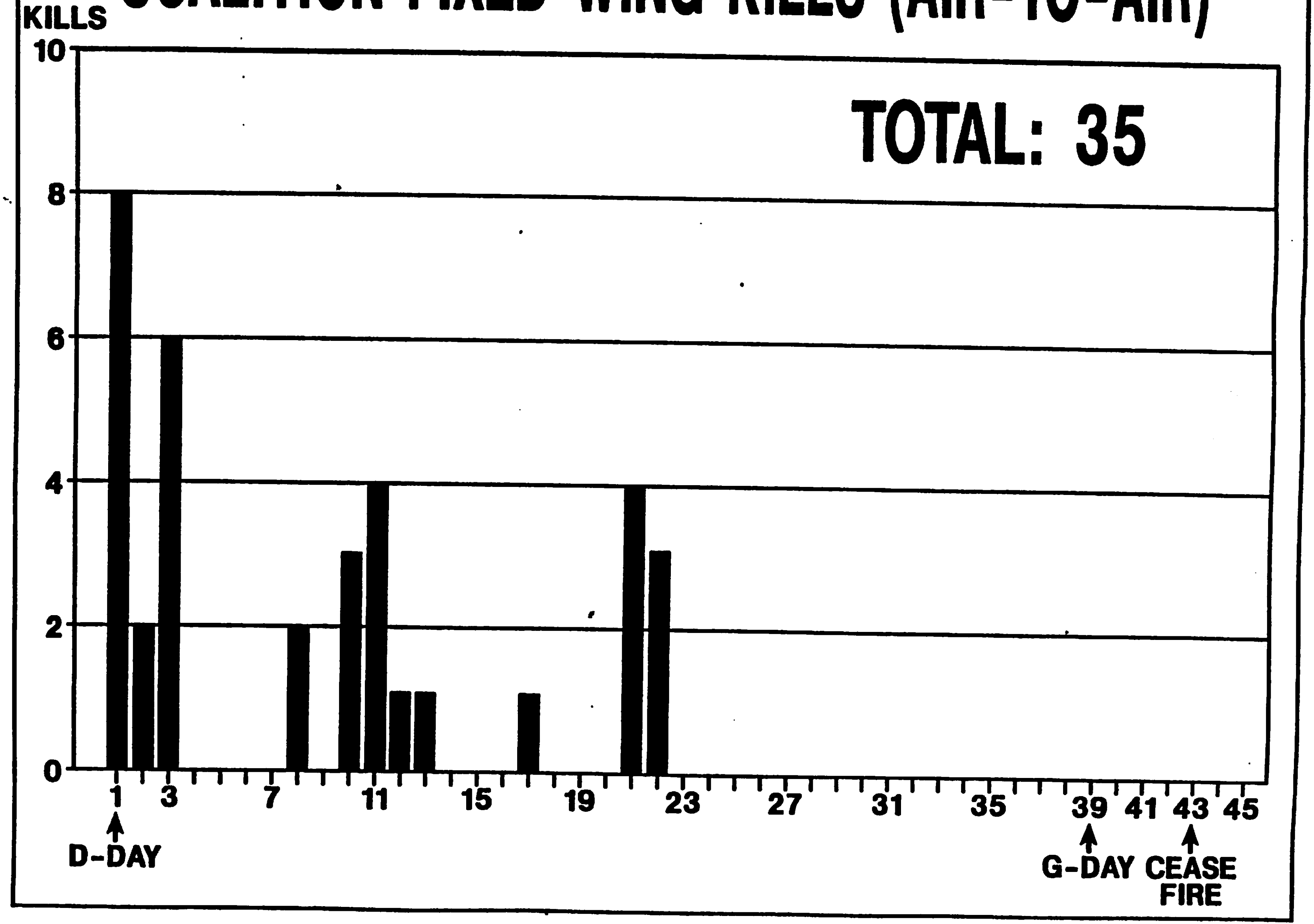
IRAQI FLIGHT ACTIVITY



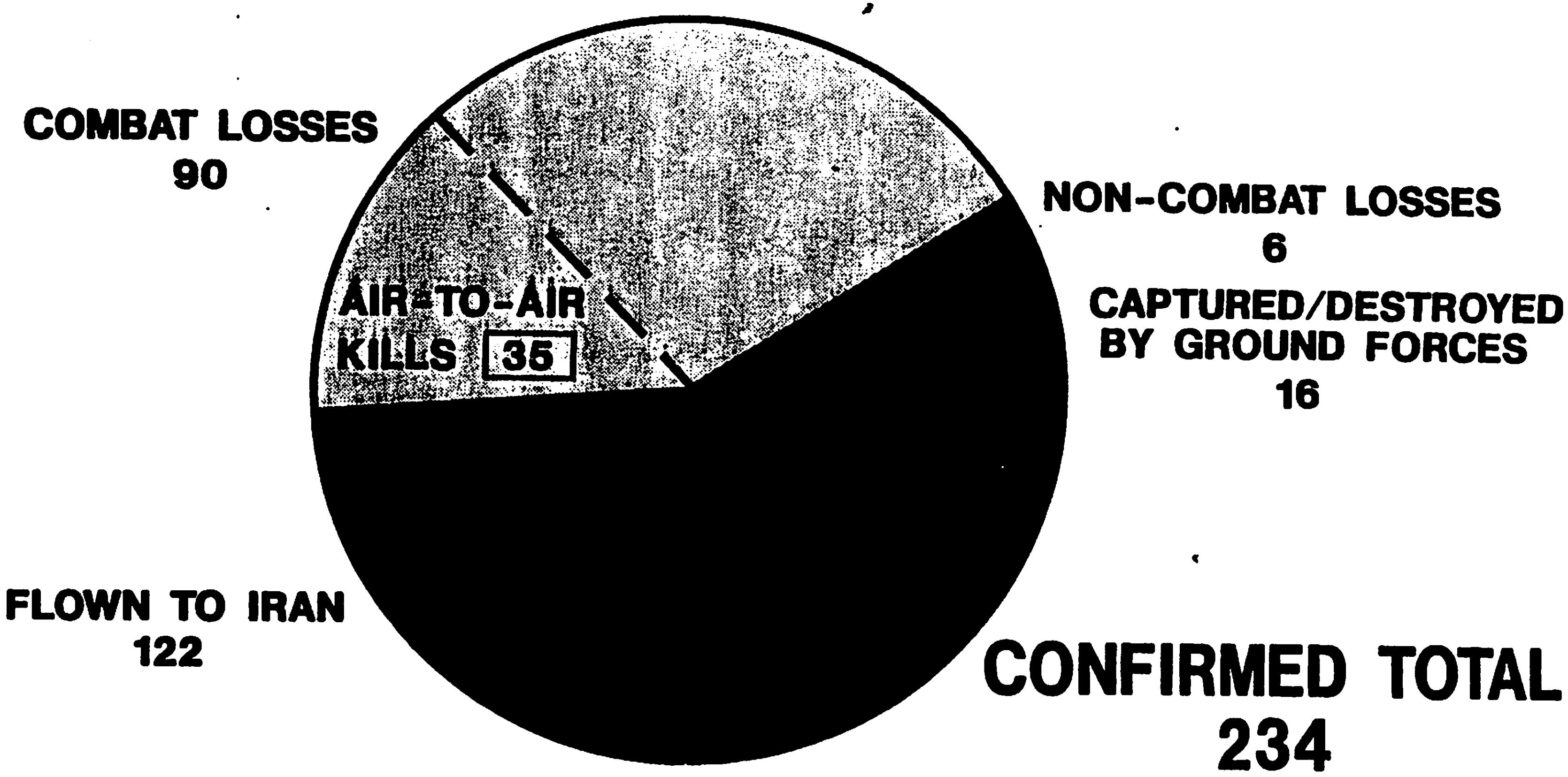


IRAQI FLIGHTS TO IRAN

COALITION FIXED WING KILLS (AIR-TO-AIR)



IRAQI AIR FORCE ATTRITION

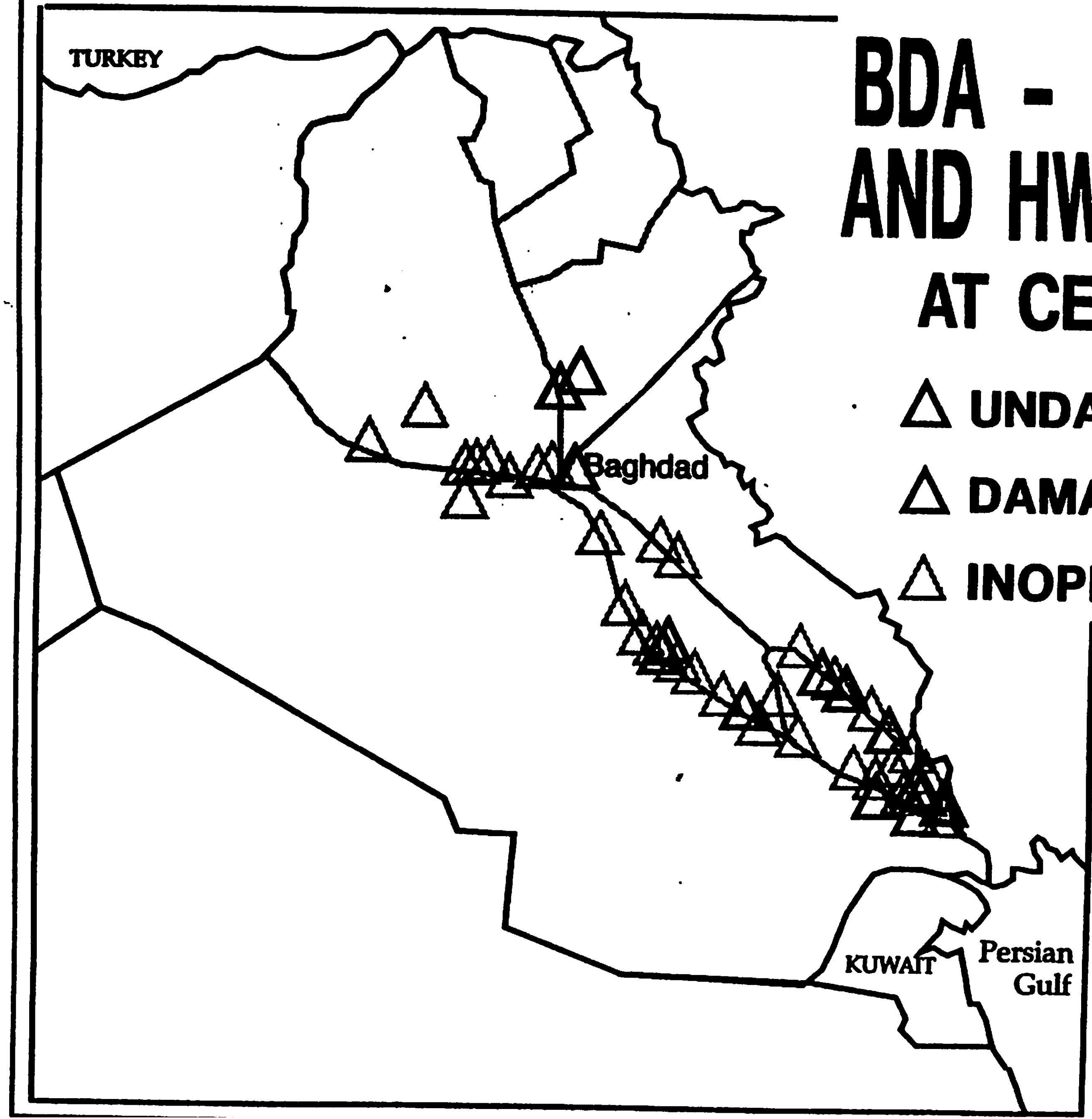


CONFIRMED TOTAL
234

594 AIRCRAFT SHELTERS
375 DAMAGED/DESTROYED
141 ESTIMATED AIRCRAFT IN SHELTERS

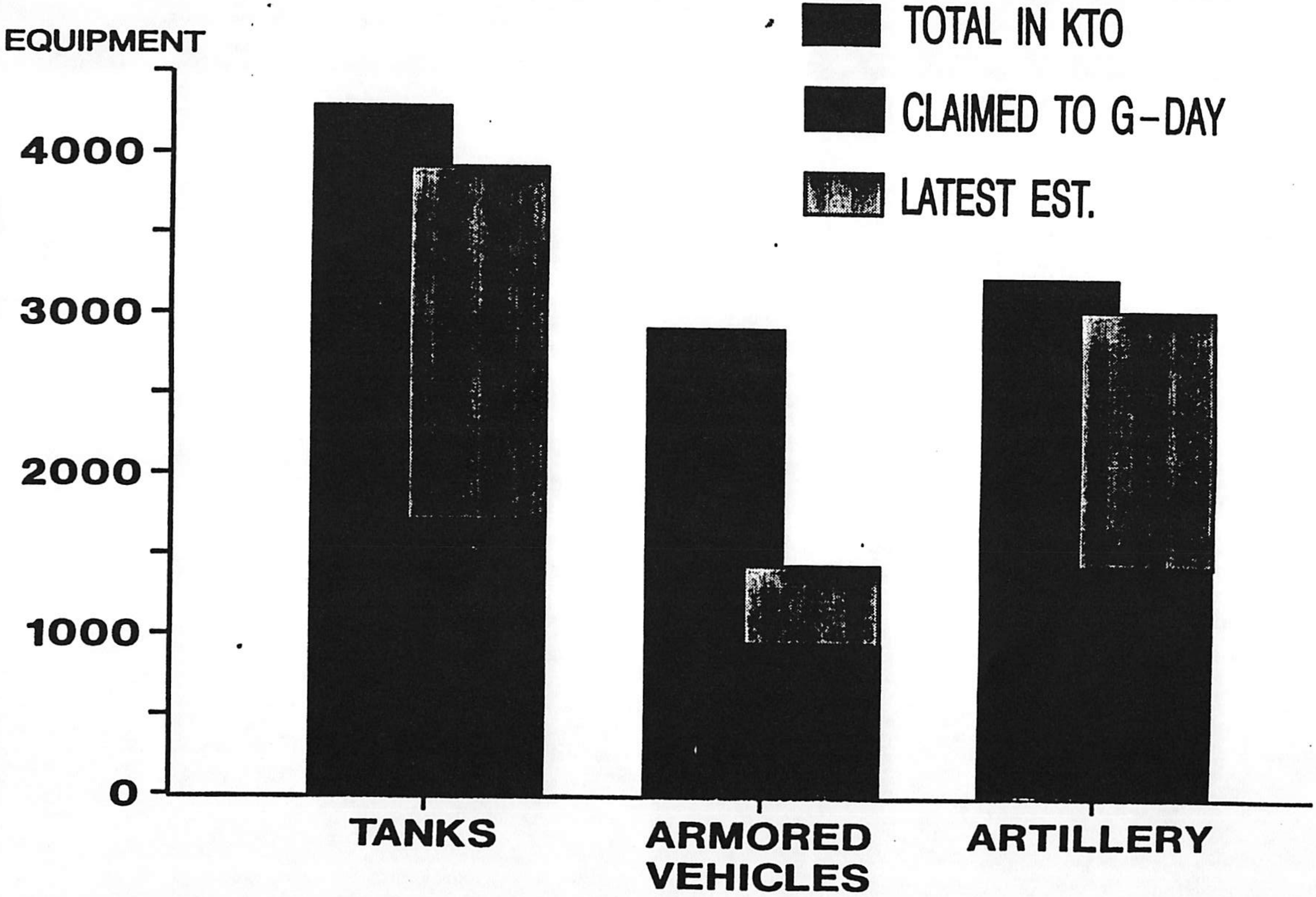
BDA - RAILROADS AND HWY BRIDGES

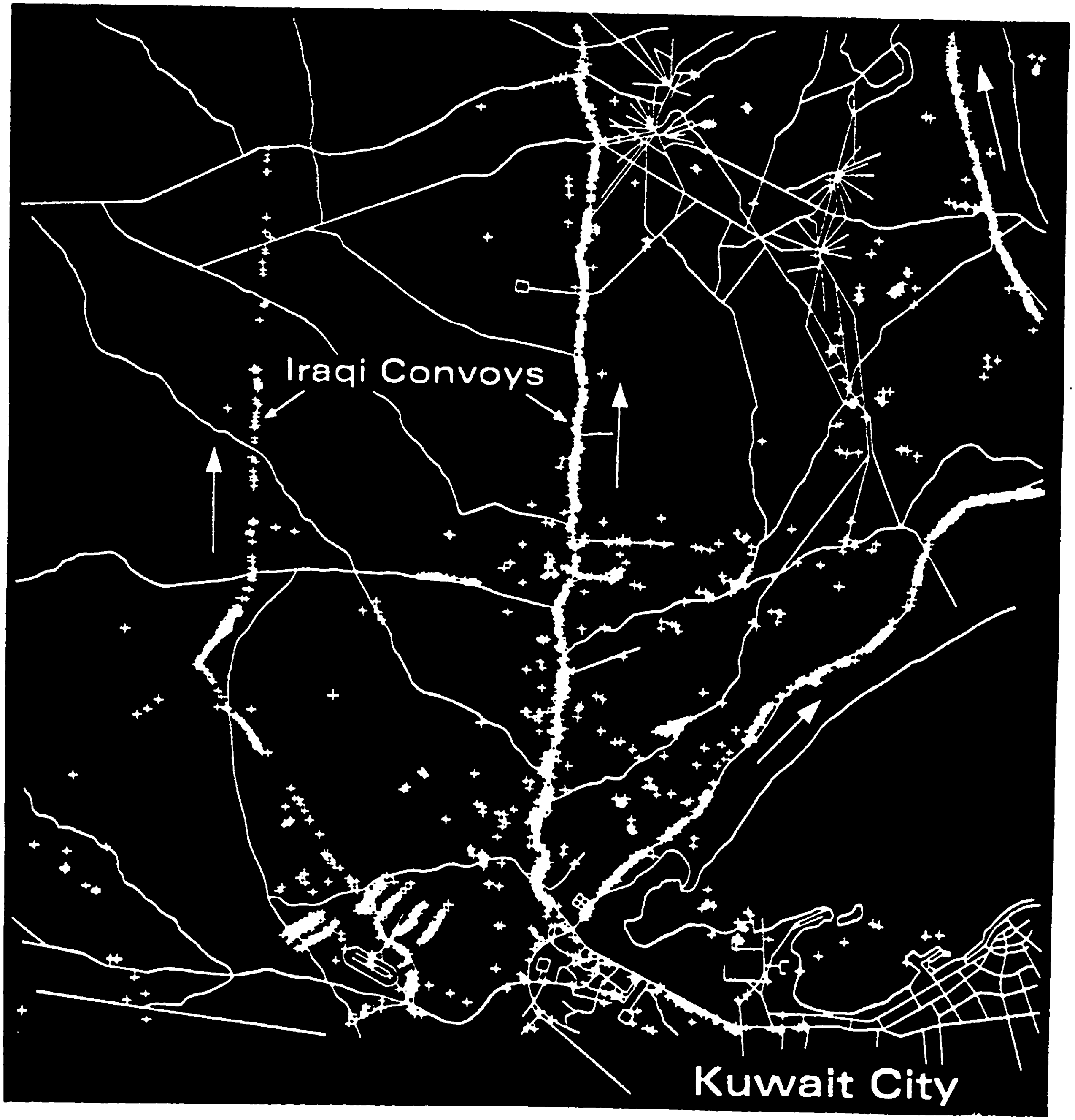
AT CEASE FIRE



△	UNDAMAGED	4
△	DAMAGED	10
△	INOPERABLE	40
		54

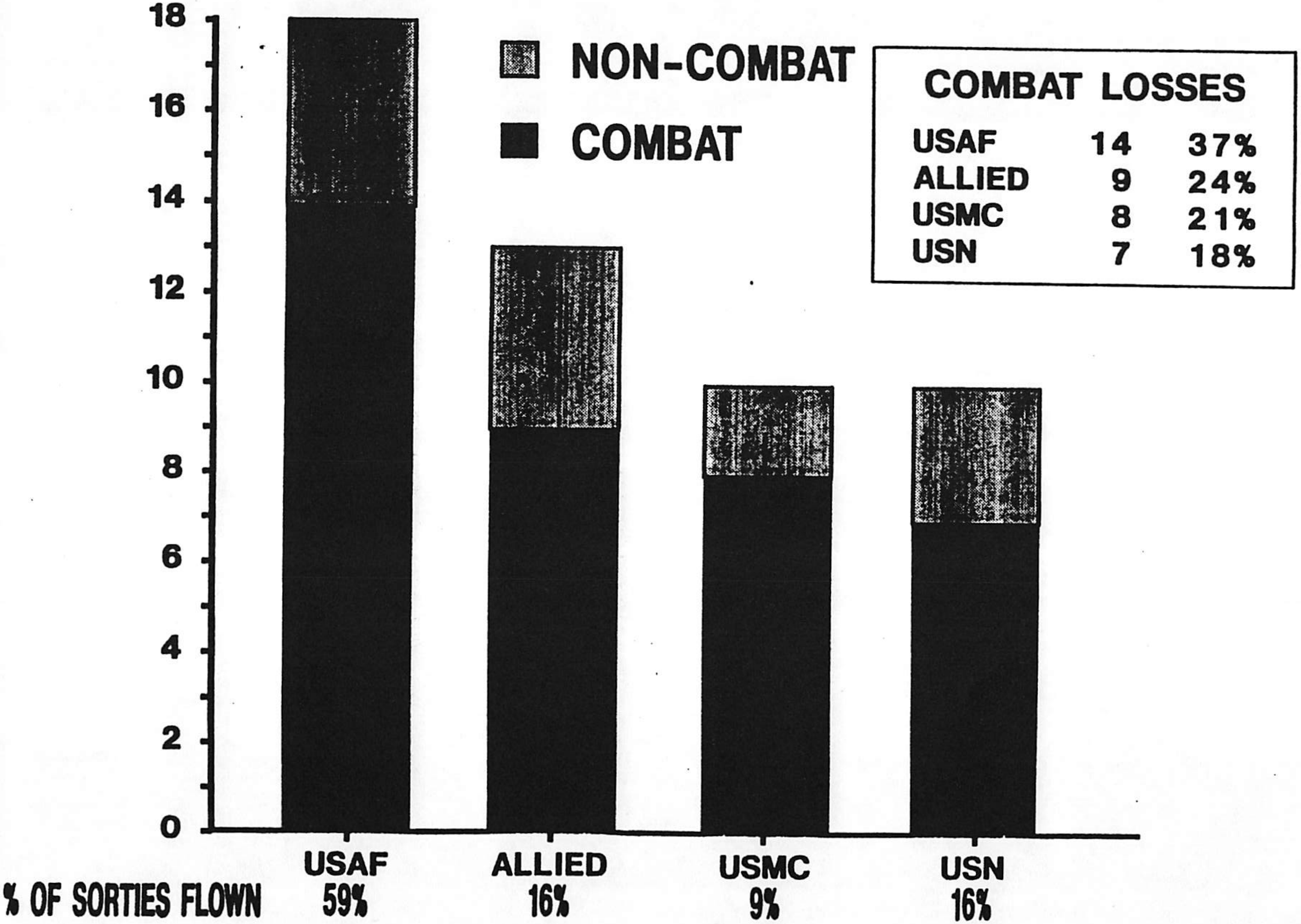
IRAQI EQUIPMENT DESTROYED





JSTARS SNAPSHOT OF THE KTO

COALITION AIR ATTRITION

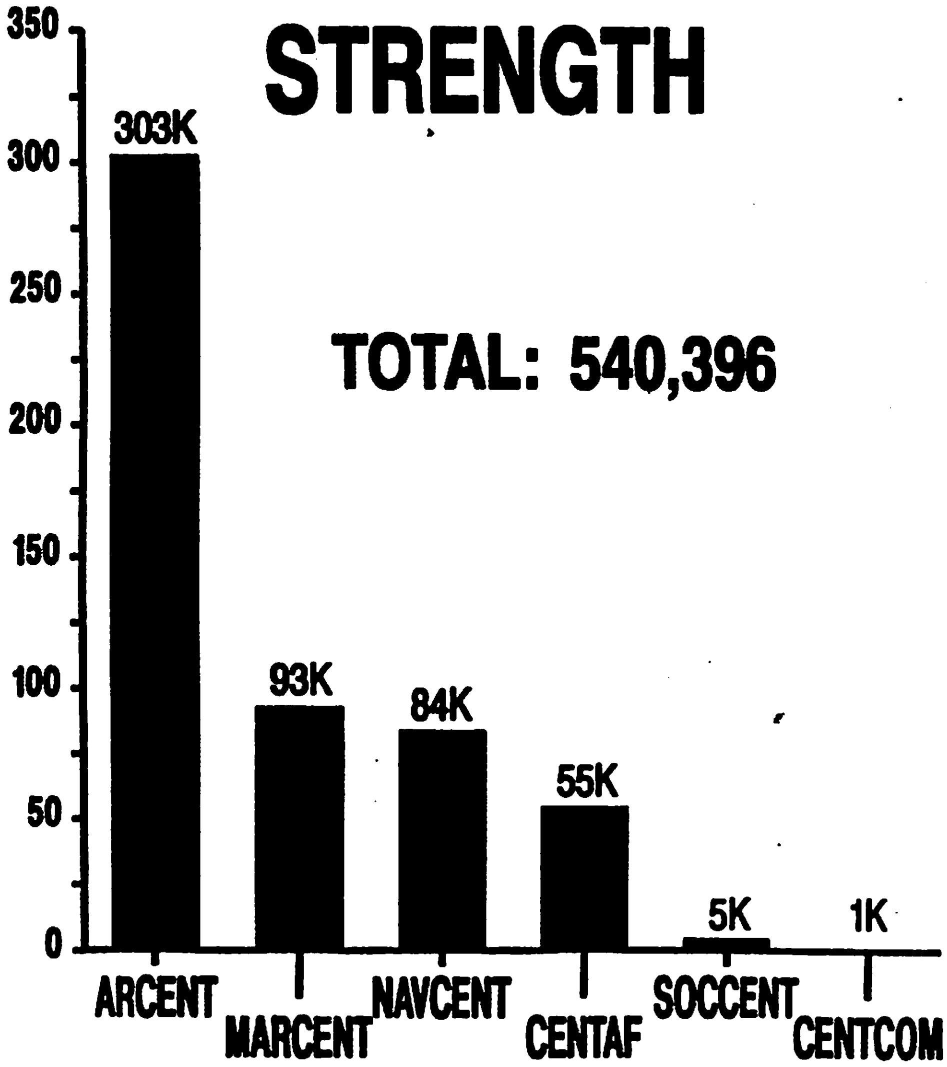


COMBAT LOSSES

USAF	14	37%
ALLIED	9	24%
USMC	8	21%
USN	7	18%

PERSONNEL

STRENGTH



TOTAL: 540,396

CASUALTIES

	KIA	WIA	MIA	NON-CMBT
ARCENT	103	235	0	1166
MARCENT	24	91	0	562
NAVCENT	1	8	5	67
CENTAF	3	0	3	52
SOCCENT	0	0	14	9
CENTCOM	0	0	0	0
TOTAL	131	334	22	1856

KIA BY USAF FRIENDLY FIRE: 13

LESSONS (RE)LEARNED

- CRUCIAL TO HAVE GOOD LEADERSHIP
- GLOBAL REACH OF THE AIR FORCE
- A SINGLE CONCEPT OF OPERATIONS
- IMPORTANCE OF AIR SUPERIORITY
- FLEXIBILITY IN EXECUTION OF AIR OPERATIONS
- CONTRIBUTION OF STEALTH TECHNOLOGY
- DESTRUCTIVE POWER OF PRECISION GUIDED WEAPONS
- *IMPORTANCE OF QUALITY PEOPLE & REALISTIC TRAINING*

GROUP PORTRAIT OF IRAQI AIR FORCE

" We went halfway around the world to do what is moral and just and right. We fought hard, and – with others – we won the war. We lifted the yoke of aggression and tyranny from a small country that many Americans had never heard of, and we ask nothing in return."

PRESIDENT BUSH
March 6, 1991

UN Report

A. General remarks

8. I and the members of my mission were fully conversant with media reports regarding the situation in Iraq and, of course, with the recent WHO/UNICEF report on water, sanitary and health conditions in the Greater Baghdad area. It should, however, be said at once that nothing that we had seen or read had quite prepared us for the particular form of devastation which has now befallen the country. The recent conflict has wrought near-apocalyptic results upon the economic infrastructure of what had been, until January 1991, a rather highly urbanized and mechanized society. Now, most means of modern life support have been destroyed or rendered tenuous. Iraq has, for some time to come, been relegated to a pre-industrial age, but with all the disabilities of post-industrial dependency on an intensive use of energy and technology.

9. My mandate was limited to assessing the need for urgent humanitarian assistance. It did not extend to the huge task of assessing the requirements for reconstructing Iraq's destroyed infrastructure, much less, to developmental matters. Accordingly, my report to you, in its several technical sections, seeks with as much exactitude as possible to convey the extent of needs in the primary areas of humanitarian concern: for safe water and sanitation, basic health and medical support; for food; for shelter; and for the logistical means to make such support actually available. Underlying each analysis is the inexorable reality that, as a result of war, virtually all previously viable sources of fuel and power (apart from a limited number of mobile generators) and modern means of communication are now, essentially, defunct. The far-reaching implications of this energy and communications' vacuum as regards urgent humanitarian support are of crucial significance for the nature and effectiveness of the international response.

10. These conditions, together with recent civil unrest in some parts of the country, mean that the authorities are as yet scarcely able even to measure the dimensions of the calamity, much less respond to its consequences, because they cannot obtain full and accurate data. Additionally, there is much less than the minimum fuel required to provide the energy needed for movement or transportation, irrigation or generators for power to pump water and sewage. For instance, emergency medical supplies can be moved to health centres only with extreme difficulty and, usually, major delay. Information regarding local needs is slow and sparse. Most employees are simply unable to come to work. Both the authorities and the trade unions estimate that approximately 90 per cent of industrial workers have been reduced to inactivity and will be deprived of income as of the end of March. Government departments have at present only marginal attendance. Prior to recent events, Iraq was importing about 70 per cent of its food needs. Now, owing to the fuel shortage, the inability to import and the virtual breakdown of the distribution system, the flow of food through the private sector has been reduced to a trickle, with costs accelerating upwards. Many food prices are already beyond the purchasing reach of most Iraqi families. Agricultural production is highly mechanized, and much land depends on pumped-water irrigation. Should the main harvest in June 1991 be seriously affected by a lack of energy to drive machines and pump water, then an already grave situation will be further aggravated. As shown below, prospects for the 1992 harvest could, for combined reasons, be in at least as much jeopardy. Having regard to the nature of

Iraq's society and economy, the energy vacuum is an omnipresent obstacle to the success of even a short-term, massive effort to maintain life-sustaining conditions in each area of humanitarian need.

B. Food and agriculture

11. Mission members held working sessions with counterparts from the relevant ministries, visited social centres where various vulnerable groups are cared for, agricultural production areas, a seed production centre, a veterinary health centre and a dairy production unit. The mission noted that Iraq has been heavily dependent on food imports which have amounted to at least 70 per cent of consumption needs. Seed was also imported. Sanctions decided upon by the Security Council had already adversely affected the country's ability to feed its people. New measures relating to rationing and enhanced production were introduced in September 1990. These were, however, in turn, negatively affected by the hostilities which impacted upon most areas of agricultural production and distribution.

Food

12. Food is currently made available to the population both through government allocation and rations, and through the market. The Ministry of Trade's monthly allocation to the population of staple food items fell from 343,000 tons in September 1990 to 182,000 tons, when rationing was introduced, and was further reduced to 135,000 tons in January 1991 (39 per cent of the pre-sanctions level). While the mission was unable to gauge the precise quantities still held in government warehouses, all evidence indicates that flour is now at a critically low level, and that supplies of sugar, rice, tea, vegetable oil, powdered milk and pulses are currently at critically low levels or have been exhausted. Distribution of powdered milk, for instance, is now reserved exclusively for sick children on medical prescription.

13. Livestock farming has been seriously affected by sanctions because many feed products were imported. The sole laboratory producing veterinary vaccines was destroyed during the conflict, as inspected by the mission. The authorities are no longer able to support livestock farmers in the combat of disease, as all stocks of vaccine were stated to have been destroyed in the same sequence of bombardments on this centre, which was an FAO regional project.

14. The country has had a particular dependence upon foreign vegetable seeds, and the mission was able to inspect destroyed seed warehouses. The relevant agricultural authorities informed the mission that all stocks of potatoes and vegetable seeds had been exhausted. Next season's planting will be jeopardized if seeds are not provided before October 1991.

15. This year's grain harvest in June is seriously compromised for a number of reasons, including failure of irrigation/drainage (no power for pumps, lack of spare parts); lack of pesticides and fertilizers (previously imported); and lack of fuel and spare parts for the highly-mechanized and fuel-dependent harvesting machines. Should this harvest fail, or be far below average, as is very likely barring a rapid change in the situation, widespread starvation conditions become a real possibility.

/...

16. The official programme for the support of socially dependent groups of the population (the elderly, disabled, mothers and children, hospital patients, orphans, refugees, etc.) is affected by the overall grave deficiencies in the food situation.

17. The mission had the opportunity to conduct independent research relating to household costs and living standards in Baghdad. Such standards have declined rapidly in the last months, while food and fuel prices have climbed dramatically. Price increases in the August to January period reflected shortages of supply, but since January there has been a further acceleration of price increases reflecting both supply shortages and the breakdown of the transport system. Interviews with private wholesale food distributors revealed that their stocks are near depletion and they no longer have an organized private transport capacity, owing to fuel shortages. The government-initiated rationing system was designed to provide families with a fraction of their basic necessities at prices comparable to those prevailing before August. The system allows families either 5 kilograms per person, per month, of flour or 3 loaves of baked bread; 10 kilograms per family, per month, of liquid cooking gas; 1 bar of soap per person, per month, etc. However, independent surveys conducted by the mission in several diverse areas of Baghdad showed that many families cannot draw their full rations, since the distribution centres are often depleted and they have great difficulty in travelling to other centres. The quality of food distributed has itself deteriorated to the point of causing health problems. Most families also reported that they could not meet their needs through the private markets. Despite official price controls, the independent market surveys conducted by the mission showed hyperinflation since August. The price of most basic necessities has increased by 1,000 per cent or more. For example, flour is now 5-6 dinars per kilogram (and seemingly still rising); rice has risen to 6 dinars per kilogram; sugar to 5 dinars per kilogram; lentils to 4 dinars per kilogram; and whole milk to 10 dinars. In contrast to this hyperinflation, many incomes have collapsed. Many employees cannot draw salaries, the banking system has in large measure closed down and withdrawals are limited to 100 dinars per month. The minimum monthly wage was 54 dinars and the average monthly salary of a civil servant was 70 dinars. In short, most families lack access to adequate rations or the purchasing power to meet normal minimal standards.

18. The mission recommends that, in these circumstances of present severe hardship and in view of the bleak prognosis, sanctions in respect of food supplies should be immediately removed, as should those relating to the import of agricultural equipment and supplies. The urgent supply of basic commodities to safeguard vulnerable groups is strongly recommended, and the provision of major quantities of the following staples for the general population: milk, wheat flour, rice, sugar, vegetable oil and tea. These are required to meet minimum general requirements until the next harvest. Safeguarding the harvest means the urgent importation of fertilizers, pesticides, spare parts, veterinary drugs, agricultural machinery and equipment, etc. The mission was able to quantify many of these needs. The disappearance of vegetables from the country's markets also appears likely by the summer, and seed importation is crucial.

19. The mission observes that, without a restoration of energy supplies to the agricultural production and distribution sectors, implementation of many of the above recommendations would be to little effect. Drastic international measures across the whole agricultural spectrum are most urgent.

C. Water, sanitation and health

20. As regards water, prior to the crisis Baghdad received about 450 litres per person supplied by seven treatment stations purifying water from the Tigris river. The rest of the country had about 200-250 litres per person per day, purified and supplied by 238 central water-treatment stations and 1,134 smaller water projects. All stations operated on electric power; about 75 per cent had standby diesel-powered generators. Sewage was treated to an acceptable standard before being returned to the rivers.

21. With the destruction of power plants, oil refineries, main oil storage facilities and water-related chemical plants, all electrically operated [water] installations have ceased to function. Diesel-operated generators were reduced to operating on a limited basis, their functioning affected by lack of fuel, lack of maintenance, lack of spare parts and non-attendance of workers. The supply of water in Baghdad dropped to less than 10 litres per day but has now recovered to approximately 30-40 litres in about 70 per cent of the area (less than 10 per cent of the overall previous use). Standby generating capacity is out of order in several pumping stations and cessation of supplies will therefore ensue if current machinery goes out of order for any reason (spare parts are not available owing to sanctions). As regards the quality of water in Baghdad, untreated sewage has now to be dumped directly into the river - which is the source of the water supply - and all drinking-water plants there and throughout the rest of the country are using river water with high sewage contamination. Recently, the water authority has begun to be able to improve the quality of drinking water by adding more of the remaining stock of alum and chlorine after assurances from UNICEF and ICRC that emergency aid would be provided. Chemical tests are now being conducted at the stations but no bacteriological testing and control is possible because of the lack of electricity necessary for the functioning of laboratories, the shortage of necessary chemicals and reagents and the lack of fuel for the collection of samples. No chlorine tests are being conducted because of the lack of fuel for sampling. While the water authority has warned that water must be boiled, there is little fuel to do this, and what exists is diminishing. Cool winter conditions have prevailed until recently.

22. Only limited information is available to authorities regarding the situation in the remainder of the country because all modern communications systems have been destroyed and information is now transmitted and received (in this sector as in all others) by person-to-person contact. In those areas where there are no generators, or generators have broken down, or the fuel supply is exhausted, the population draws its water directly from polluted rivers and trenches. This is widely apparent in rural areas, where women and children can be seen washing and filling water receptacles. The quantity and quality of water produced by treatment centres is very variable and in many locations there are no chemicals available for

purification. No quality control - chlorine testing, chemical testing or bacteriological testing - is being conducted.

23. The mission identified the various problems mentioned above: heavy sewage-pollution of water intakes; absence or acute shortage of water-treatment chemicals, especially aluminium sulphate (alum) and chlorine; lack of power to operate equipment; lack or shortage of diesel to run generators; inability to repair generators because of lack of spare parts; in some instances a total absence of generators; the destruction of some stations; absence of water-testing; lack of a health surveillance system in respect of communicable, and, especially, water-borne diseases. A further major problem, now imminent, is the climate. Iraq has long and extremely hot summers, the temperature often reaching 50 degrees Celsius. This has two main implications: (a) the quantity of water must be increased, and a minimum target of 50 litres per person per day has to be attained (this entails a gross output of 65 litres per person at the source); and (b) the heat will accelerate the incubation of bacteria, and thus the health risks ascribable to the water quality (already at an unacceptable level) will be further exacerbated - especially viewed in the overall sanitary circumstances which have already led to a fourfold increase in diarrhoeal disease incidence among children under five years of age, and the impact of this on their precarious nutritional status.

24. As regards sanitation, the two main concerns relate to garbage disposal and sewage treatment. In both cases, rapidly rising temperatures will soon accentuate an existing crisis. Heaps of garbage are spread in the urban areas and collection is poor to non-existent. The work of collection vehicles is hampered by lack of fuel, lack of maintenance and spare parts and lack of labour, because workers are unable to come to work. Incinerators are in general not working, for these same reasons, and for lack of electric power. Insecticides, much needed as the weather becomes more torrid, are virtually out of stock because of sanctions and a lack of chemical supplies. As previously stated, Iraqi rivers are heavily polluted by raw sewage, and water levels are unusually low. All sewage treatment and pumping plants have been brought to a virtual standstill by the lack of power supply and the lack of spare parts. Pools of sewage lie in the streets and villages. Health hazards will build in the weeks to come.

25. As regards health conditions, the mission reviewed the situation since the special joint WHO-UNICEF mission in February 1991. It found that the recommendations made in that report (S/22328), subsequently approved by the Security Council Committee established by resolution 661 (1990) concerning the situation between Iraq and Kuwait, were well-founded. The mission also identified any further immediate health problems that needed to be addressed over the next three to six months. It also identified constraints that hamper the implementation of the already-agreed recommendations of the joint mission. It found that health conditions in Baghdad and throughout the country remain precarious. A major factor is the water and sanitation situation described above. Additionally, the total lack of telephone communication and drastically reduced transport capability pose other problems to the health system since basic information on communicable diseases cannot be collected and disseminated, and essential drugs, vaccines and medical supplies cannot be distributed efficiently to the country. Mission health

D. Refugees and other vulnerable groups

28. Conditions described above affect the whole population of Iraq and, most especially, low-income groups. The mission paid particular attention to the plight of especially vulnerable groups, whether Iraqi or non-Iraqi. Thus, it found that care for orphans, the elderly and the handicapped had been in many instances disrupted, with residents of institutions having had to be moved and regrouped at various locations. It recommends the urgent implementation of a humanitarian programme aimed at enabling some 25 orphanages and 71 other social welfare centres to resume their normal activities and at providing their beneficiaries with essential relief supplies, and specifies essential inputs for this purpose.

29. [As regards the displaced and the homeless, the authorities themselves have not yet been able fully to assess the impact of the recent hostilities. They have, however, calculated that approximately 9,000 homes were destroyed or damaged beyond repair during the hostilities, of which 2,500 were in Baghdad and 1,900 were in Basrah. This has created a new homeless potential total of 72,000 persons. Official help is now hampered by the conditions described throughout this report and, especially, a virtual halt in the production of local building materials and the impossibility to import.] The input of essential materials should be permitted.

30. The mission was unable, in the time available and having regard to the incomplete data in the hands of the authorities, to ascertain the number of foreign workers of Arab and other nationalities still resident in Iraq. It has been estimated that approximately 750,000 were still present in January 1991. It can at this stage be no more than a matter of surmise whether a number of those remaining may be in need of support to return to their countries of origin.

31. Some 64,000 Iranian nationals, protected under either the Fourth Geneva Convention relative to the Protection of Civilian Persons in Time of War of 14 August 1949, or the 1951 Convention relating to the Status of Refugees, had previously resided in three camps in Iraq. There has been substantial dislocation of some of these persons. Others have indicated their desire for repatriation. Limited relief assistance is urgently needed for some of those who have been obliged to leave one of the camps. Additionally, some 80,000 Palestinians are resident in Iraq, including a group of 35,000 considered as refugees benefiting from the protection of the Iraqi Government. It has been reported that several hundred Palestinians have recently come to Baghdad from Kuwait and are now in need of emergency assistance. Certain measures have been developed to provide urgent assistance to those most in need.

E. Logistics: transportation, communications and energy

32. The mission examined transportation, communications and energy facilities, as it increasingly emerged that adequate logistics and energy would be essential to support and make effective emergency humanitarian assistance.

33. As regards transportation, the fact that the country has been on a war footing almost continuously since 1980 has undermined its capacity. At present, Iraq's

sole available surface transport link with the outside world is via Amman to Aqaba. (It has been reported that a bridge has recently been destroyed on the Iskenderun/Mersin road to Iraq from Turkey; and the ports of Basrah and Umm Qasr are currently out of use; nor has there for some years been any direct cargo traffic to Iraq via the Syrian Arab Republic.) [Internal transportation by road is now severely affected by a lack of spare parts and tyres and, above all, by a lack of fuel. Some internal railway capability still exists on the Baghdad-Mosul line. The mission was informed that a total of 83 road bridges had been destroyed and a number were inspected.

34. As regards communications, the mission was informed that all internal and external telephone systems had been destroyed, with the exception of a limited local exchange in one town. It had the opportunity to inspect a number of war-damaged or destroyed facilities and experienced for itself the situation in the Greater Baghdad and other urban areas. Communication in Iraq is now on a person-to-person basis, as mail services have also disintegrated.]

35. The role of energy in Iraq is especially important because of the level of its urbanization (approximately 72 per cent of the population lives in towns), its industrialization, and its prolonged, very hot, summers. Pre-war energy consumption consisted of oil and refined products (85 per cent), electricity (14.8 per cent) and other sources (0.2 per cent). About 30 per cent of electric power generation was hydro-power. Bombardment has paralysed oil and electricity sectors almost entirely. Power output and refineries' production is negligible and will not be resumed until the first repair phase is complete. The limited and sporadic power supply in some residential areas and for health facilities is provided by mobile generators. There have, officially, been virtually no sales of gasoline to private users since February. The mission was told that the only petrol, oil and lubricants (POL) products now available are heating oil (rationed to 60 litres per month, per family) and liquefied petroleum gas (LPG), which is rationed to one cylinder per month, per family. The authorities stated that stocks of these two products are close to exhaustion and that their distribution is expected to cease within the next 2-4 weeks. While work is under way to clear sites and assess damages, lack of communications and transport is retarding this activity. Initial inspections are said to show that necessary repairs to begin power generation and oil refining at minimal levels may take anywhere from 4 to 13 months. Minimal survival level to undertake humanitarian activities would require approximately 25 per cent of pre-war civilian domestic fuel consumption. Its absence, given the proximate onset of hot weather conditions, may have calamitous consequences for food, water supply and for sanitation; and therefore for health conditions. It seems inescapable that these fuel imports must take place urgently, and units and spare parts will also be required to enable Iraq to meet its own humanitarian needs as soon as possible. Under optimal circumstances it would be difficult or impossible for such needs to be provided from other sources given all the circumstances of that country's economy and social conditions, and bearing also in mind the limited bulk transportation possibilities that are likely to exist for the foreseeable future.

36. During my final meetings in Baghdad on 16 March I made reference to the need to be able to assess the effective utilization of all inputs that might in future

/...

be established under the responsibility of the United Nations. The Government assured the mission that it would accept a system of monitoring of imports and their utilization.

F. Observations

37. The account given above describes as accurately as the mission has been able, using all sources, including much independent observation, to ascertain the situation, which, within the time available and the travel limitations referred to earlier, was perceived to exist in regard to urgent humanitarian needs in Iraq during the week of 10-17 March. I, together with all my colleagues, am convinced that there needs to be a major mobilization and movement of resources to deal with aspects of this deep crisis in the fields of agriculture and food, water, sanitation and health. Yet the situation raises, in acute form, other questions. For it will be difficult, if not impossible, to remedy these immediate humanitarian needs without dealing with the underlying need for energy, on an equally urgent basis. The need for energy means, initially, emergency oil imports and the rapid patching up of a limited refining and electricity production capacity, with essential supplies from other countries. Otherwise, food that is imported cannot be preserved and distributed; water cannot be purified; sewage cannot be pumped away and cleansed; crops cannot be irrigated; medicaments cannot be conveyed where they are required; needs cannot even be effectively assessed. It is unmistakable that the Iraqi people may soon face a further imminent catastrophe, which could include epidemic and famine, if massive life-supporting needs are not rapidly met. The long summer, with its often 45 or even 50 degree temperatures (113-122 degrees Fahrenheit), is only weeks away. Time is short.

Health Officials in Iraq Fear Cholera Epidemic

NYT 4/28/91

By PAUL LEWIS

Special to The New York Times

BAGHDAD, Iraq, April 27 — The United Nations and other relief agencies are reporting a substantial increase in cases of severe diarrhea, vomiting and dehydration among small children in Iraq, symptoms commonly associated with cholera.

While the Iraqi Health Ministry has only confirmed one case of cholera so far, United Nations relief workers say they suspect that many more exist, particularly around the southern city of Basra and at Mosul in the north. But they are not yet prepared to say an epidemic has broken out. Such cases are difficult to verify because the destruction of Iraq's electrical system by allied bombs has left the country with few functioning laboratories.

"We are treating all severe diarrhea cases as cholera although we are not yet sure we have an epidemic," said Dr. Ezzio Gianni Murzi, an Italian physician who heads the operations of Unicef in Iraq.

Dominique Dufour, who heads the mission from the International Committee of the Red Cross here, said: "There are tentative cases of cholera. But to be sure, you need to grow a culture for 24 hours and hospitals and laboratories don't have enough electricity to do that."

Deaths at 10 to 20 Times Normal

No accurate figures exist for child deaths. But Mr. Dufour and Dr. Murzi say Iraqi health workers report a big increase in cases of diarrhea and dehydration among the very young, with deaths running sometimes 10 to 20 times the normal rate in parts of the country.

A major reason for this is that the lack of electricity has paralyzed water purification and sewage plants, while in many cases the allied air raids have cut water distribution systems as well. But another cause of such infant diseases stems from the shortage of powdered milk and other baby foods.

Dr. Murzi said suspected cholera cases are now running at around three a day in Basra and about 10 a day in Mosul, where the water supply is seriously contaminated. On April 11, he said he saw 11 suspected cases in Mosul and believes this figure may now have reached about 150.

The situation appears to be better in Baghdad, home to about 25 percent of Iraq's population, where the water quality is superior to that of the rest of the country.

Dr. Murzi said that two other serious children's diseases — marasmus and kwashiorkor, which are both associated with poor diet and unclean drinking water — have reappeared in Iraq recently for the first time in more than a decade.

Of special concern is the condition of Kurdish families who fled to the mountains to escape last month's unsuccessful uprising against the Government of President Saddam Hussein. The United Nations now reckons these refugees are returning home at a rate of about 1,500 families a day, often to find that the fighting has left their villages without clean water or medical supplies.

A war to win clean water and vanquish disease.

To meet the needs of returning Kurdish children, Unicef flew in 29 tons of high-protein baby food today, and on Sunday it is scheduled to send 44 tons of health kits that should meet the basic medical needs of some 500,000 people for three months.

Dr. Murzi said Unicef hopes to start a vaccination program for Kurdish children next week after it has set up a system for distributing vaccines to rural health centers.

To improve water quality in the north, the Red Cross has started a scheme for capping pure springs up in the mountains and piping their water down to villages in the valley so that it is not contaminated on the way.

"Otherwise, you find people washing in the streams and bringing their cattle to drink," Mr. Dufour said.

As summer approaches and the weather heats up, relief agencies have set themselves targets for increasing the supply of clean water.

The aim, Dr. Murzi says, is to provide approximately 60 liters a day of purified water for every urban dweller by June or July.

At present, Baghdad has almost reached this target, with about 45 to 50 liters of treated water daily for each inhabitant. But the figure in Basra is far lower and probably well under 20 liters a day, he said.

World

were finally becoming clear—at least, to pundits and journalists in the field. "On the battered approach road to Kirkuk, shell casings and burnt-out vehicles clutter the roads, and machine gun fire has peppered almost every building," writes a British reporter traveling with the Republican Guards. "Oil fires rage on the horizon, and the smell of diesel and decaying human flesh chokes the air." Kirkuk falls to Saddam's advancing forces. "We are driving them out, and we do not take prisoners," the city's mayor says. To the south, American troops watch in horror as Saddam's troops attack the town of Samawah, firing tank rounds into a hospital, strafing hundreds of civilians huddled in a ditch. The Iraqi troops fire random barrages point-blank. Kids and women are shot in the back. In towns considered disloyal to Saddam, the Republican Guard kills everyone.

For our erstwhile enemies, it's not much better. "Nothing that we had seen or read had quite prepared us for the particular form of devastation which has now befallen the country," wrote United Nations undersecretary general Martti Ahtisaari in his March 20 report. "The recent conflict has wrought near-apocalyptic results upon the economic infrastructure of what had been, until January, 1991, a rather highly urbanized and mechanized society. Now, most means of modern life support have been destroyed or rendered tenuous. Iraq has, for some time to come, been relegated to a pre-industrial age, but with all the disabilities of post-industrial dependency on an intensive use of energy and technology."

RICK REINHARD

Bunker down: the Baghdad shelter where between 500 and 700 civilians died in a U.S. air raid

When this report was written, there was no power to pump either water or sewage. Communications were destroyed. The country depends on imported foods, the prices of which were rising, but at the same time, most people could not go to work. The banking system was disrupted, so no one had the currency they needed to buy the food anyway. Agriculture, which depends on pumps that fill the irrigation system, was imperiled, especially with the June harvest looming. International sanctions had already hurt the agricultural economy by cutting off imports of pesticides, fertilizers, and feed for livestock. Besides destroying infrastructure and power grids essential to food production, coalition bombing occasionally took out recent attempts to introduce more modern farming techniques, like a UN project that manufactured animal vaccines. The air raids wiped out both the plant and its stores.

"These conditions, together with recent civil unrest in some parts of the country, mean that the authorities are as yet scarcely able even to measure the dimensions of the calamity, much less respond to its consequences, because they cannot obtain full and accurate data," Ahtisaari wrote.

Last week doctors and other experts from international relief agencies reported an increase in infant diarrhea outbreaks. Fuel shortages are impeding delivery of food and medical supplies. A member of Doctors Without Borders, an international relief organization, reported "massive destruction" in Basra that makes the distribution of supplies difficult, since these groups must arrange logistics on their own. His group has sent in 60 tons of relief goods, including fuel, medicine, and surgical equipment, along with trucks to transport it.

George Bush's six-week war makes a century of British and French colonialism look almost benevolent. It would be nice to think that American GIs could kick the sand from their boots and go home victorious; but unless the New World Order is to be filled with a lot more blood and disorder than we have been led to believe, this looks more and more like Saigon.

All this was an especially bitter reminder of a long legacy of American betrayal of the Kurds. After the Soviet Union and Iraq signed a treaty of friendship in 1972, both the Shah of Iran and the U.S. worried anew about Russian influence in the Middle East. So the Shah asked for military aid to the Kurds, who had been fighting for their independence from the Baathists in Iraq for decades. Overruling State and CIA staff objections, then secretary of state Henry Kissinger and president Richard Nixon sided with the Shah. From 1972 through 1975, the U.S. funneled $16 million to the Kurds. The Shah provided even more, as did the Israelis, who also had been backing them. By 1974 the Kurds had fought the Iraqis to a standstill.

Of course, neither the U.S. nor Iran seriously wanted the Kurds to succeed, for fear that would set off demands for Kurdish autonomy elsewhere—for example, inside NATO member Turkey, or Iran, or even in Syria, where there are considerable Kurdish populations. As the House Select Committee on Intelligence found in 1976 (the Pike Report), "The President, Dr. Kissinger, and a foreign head of state [the Shah] hoped our clients [the Kurds] would not prevail. They preferred

[U.S. Government] does not handle this situation deftly in a way which will avoid giving the Kurds the impression that we are abandoning them, they are likely to go public. Iran's action has not only shattered their political hopes; it endangers thousands of lives." Both Kissinger and newly minted president Gerald Ford turned a deaf ear to Kurdish pleas.

Since then, the big powers have continued to whipsaw the Kurds. In Iran, the Kurds were early supporters of the revolution, but Khomeini, after making open appeals to their religious leanings, soon turned on them. During the Iran-Iraq war, Saddam Hussein supported Kurdish autonomy in Iran; but when the war ended in 1988 he sought to finish off the Kurds in his country, dropping nerve gas on one village as an example and then launching a resettlement drive. In this most recent war, as Frank Smyth (still missing in Kurdistan as we go to press) recently reported in the *Voice*, the CIA once again was busily trying to paste together a "united front" opposition to Saddam out of disaffected Iraqi groups, including Shiites and

U.N. Survey Says Iraq Suffered Vast Damage

Continued From Page A1

territory controlled by the allied forces.

An American draft of a proposed resolution on a permanent cease-fire that has been circulating here indicates that the Bush Administration wants the Security Council to lift only the ban on food shipments to Iraq after adopting the complex new resolution setting out Washington's final terms for ending the war.

Under the American draft, even after a permanent cease-fire is set, Council permission would still be needed for imports of "materials and supplies for essential civilian needs," though the Council would examine this requirement every 60 days in the light of Baghdad's compliance with the resolution and could eventually lift it altogether.

As expected, the American draft also requires Iraq to agree to the internationally supervised destruction of its ballistic missile systems as well as chemical, biological or nuclear weapons in its possession and to renounce the development of such weapons.

1963 Frontier Cited

Only when Iraq formally agrees to these and all other provisions of the American draft, which is still under discussion among the five permanent Council members, would a cease-fire become effective.

The United States draft says Iraq must accept the boundary agreement it made with Kuwait in 1963 but subsequently rejected. And it empowers the Security Council to guarantee that frontier with "all necessary means," a phrase that would permit the use of military force against any violator.

In addition, it calls for deployment of a United Nations military observer force along the frontier to monitor possible cease-fire violations.

The draft resolution establishes a special fund to pay compensation for damage caused by Iraq's annexation of Kuwait, which would be paid for from Iraq's future oil earnings. It also authorizes nations holding frozen Iraqi assets to use these to compensate victims of Iraq's aggression.

The draft maintains a complete ban on sales of military equipment to Iraq as well as dangerous technologies used in making chemical, biological or nuclear weapons. It also requires Iraq to surrender enriched nuclear reactor fuel in its possession to the International Atomic Energy Agency in Vienna. Finally it sets out a four-month timetable for Iraq to comply with all these provisions.

The original sanctions banned all trade and financial dealings with Iraq and occupied Kuwait, except for the provision of medicine. Food was allowed in when humanitarian circumstances required, as judged by the committee.

Many companies eagerly seeking contracts to help rebuild Kuwait are finding that information is scarce and opportunities limited. Business Day, page C1.

This month the committee agreed to speed approval of shipments of food and things characterized as humanitarian supplies, including fuel and generators, to relieve suffering and stem the danger of epidemics. But the call today for a complete lifting of the restrictions on food and other goods appears to go further than the United States envisages at present.

Assessing the effects of allied bombing and the trade embargo on Iraq's economy, the new United Nations report says "the recent conflict has wrought near-apocalyptic results upon the infrastructure of what had been until January 1991 a rather highly urbanized and mechanized society."

Report says 72,000 were left homeless by the allied bombing.

The report contrasted with the American position on the issue of who would pay for any imports of supplies into Iraq. Under the American plan, Iraq would be allowed to start earning money by selling oil only after it had agreed to a complicated mechanism for paying compensation claims. The United Nations report does not make clear whether it expects Iraq to pay for its own imports or, alternatively, whether humanitarian organizations would do so instead.

The report was presented to the representatives of the 15 nations on the Security Council this afternoon. Afterwards, the United States Representative, Thomas R. Pickering, refused to comment.

Although allied military men said their warplanes sought to attack only military targets, the report says about 9,000 Iraqi homes were destroyed or damaged beyond repair during the war, including 2,500 in Baghdad and another 1,900 in Basra. About 72,000 people have been left homeless.

Washington Declines Comment

Special to The New York Times

WASHINGTON, March 21 — The Bush Administration will "give the report careful study," but declined to comment on its specific findings and recommendations, a spokesman, Roman Popadiuk, said tonight.

National Edition
Southern California: Sunny early, then cloudy. Showers by tomorrow. Risk of thundershowers. Low snow levels for season. Weather map and forecasts for other areas, page A14.

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Iraq

U.N. SURVEY CALLS IRAQ'S WAR DAMAGE NEAR-APOCALYPTIC

END TO FOOD BAN SOUGHT

Report Says Allied Bombing Has Relegated Country to a 'Pre-Industrial Age'

By PAUL LEWIS
Special to The New York Times

UNITED NATIONS, March 21 — A United Nations survey of civilian damage caused by the allied bombardment of Iraq calls the results "near apocalyptic." The survey, which was made public today, recommends an immediate end to the United Nations embargo on imports of food and other essential supplies to prevent "imminent catastrophe."

The report, prepared by a United Nations team that visited the country between March 10 and March 17, says the bombing has relegated Iraq "to a pre-industrial age" and warns that the nation could face "epidemic and famine if massive life-supporting needs are not rapidly met."

It calls for "a major mobilization and movement of resources to deal with aspects of this deep crisis in the fields of agriculture and food, water, sanitation and health." In particular, it says Iraq needs immediate substantial supplies of food, agricultural equipment, fuel, electrical generators and machinery for water purification, garbage disposal and sewage treatment.

U.S. Position on Sanctions

The report was prepared by Under Secretary General Martti Ahtisaari, who was on the mission to Iraq, accompanied by representatives of Unicef, the United Nations Development Program, the High Commissioner for Refugees, the World Health Organization and the Food and Agricultural Organization. Mr. Ahtisaari, a Finn, earned praise in 1989 for his handling of Namibia's move to independence.

Diplomats say the report's findings are likely to bring pressure for a substantial relaxation in the Security Council's trade sanctions against Iraq when the special committee monitoring compliance with the trade restrictions meets on Friday.

The United States has said sanctions should be lifted only when Baghdad fulfills all the allied coalition's conditions for a permanent cease-fire. The special United Nations committee on the restrictions can grant a waiver on food and shipments of other supplies characterized as humanitarian, but the entire embargo may be lifted only by a Security Council resolution.

Ever since the Security Council imposed its trade embargo on Iraq last summer, after the invasion of Kuwait, the United States has argued against any premature relaxation in the belief that by making life uncomfortable for the Iraqi people it will eventually en-

ics Launch Assault
Hunger, Disease in Iraq

By KIM MURPHY
TIMES STAFF WRITER

SAFWAN, Iraq—They are, in a world where misery keeps banging on the front gate with clenched brown fists, two U.S. Army medics armed with stethoscopes, antibiotics and the will to comfort a nation past solace.

The clinic in Safwan consists of a few examining tables, tall stacks of medication boxes, buckets of water mixed with antiseptic—and, everywhere, the hot, dry wind of an uneasy early summer, pushing through shattered windowpanes and rustling the robes of the waiting patients.

Here is the new front in the just-ended war: a stream of the injured, dying, ill and starving from hundreds of miles in all directions, converging on a side street of this dusty border village where a pair of physician's assistants from New York and Texas have opened what appears to be the best-supplied medical facility in southern Iraq.

In the weeks since the two warrant officers arrived, they have lured the Iraqi staff back to the clinic, seen an estimated 200 patients a day, helped scrounge up electrical generators to power a mosque and 100 houses in the surrounding village, launched a school lunch program, delivered babies, chastised neglectful parents, defied angry combatants, treated shrapnel injuries, bullet wounds, malnutrition, leprosy and congestive heart failure, handed out meal rations and comforted the grieving.

"Our main goal has been to show the people that although the war had gone on and they certainly were in dire straits, it wasn't a

Please see CLINIC, A22

Iraqi doctor at Safwan clinic treats boy who suffered burns while playing w

situation, they could pick themselves up, do something for themselves," said Chief Warrant Officer Joseph Hatch of Hamburg, N.Y.

"I like to think that the Marshall Plan begins with a bottle of water and a Hershey bar," he said in an interview.

"As a professional soldier, I fought the enemy. Now, the war's over, the shooting's done. I'm not going to turn my back on an invalid man with diabetes who's 60 years old and hasn't had insulin in a month. I look at it as a gift from the people of America to the people of Iraq. We don't hate you. How can you hate the 16-year-old mother of a dying baby?"

The clinic opened on March 19 with Hatch and the other member of this odd couple, Tunisian-born Chief Warrant Officer Mahfoudh Beaoui of San Antonio, when the 3rd Armored Division moved into Safwan, a small community on Iraq's border with Kuwait, behind the departing 1st Infantry Division.

The two medics found a gutted shell of a clinic, its medical supplies looted, its equipment smashed, window glass strewn across the floor, no running water and plugged latrines.

Retreating Iraqi soldiers had taken what they could as they left, and then, according to townspeople, incoming Kuwaiti, Egyptian and Senegalese soldiers further pillaged the facility.

Hatch and Beaoui persuaded some nervous Iraqi townspeople—fearful of cooperating with the American occupiers—to help sweep up the floors and set up what was left of the equipment, then opened the door for business.

On the first day, 400 people showed up, many dying of malnutrition, dehydration, severe diarrhea, pneumonia, parasitic infections, old infected war wounds or new injuries from fresh munitions explosions. They amputated a man's badly injured foot on the first day, sewed up the stumps of cut-off fingers, dispensed medication and dispatched some gravely ill patients for acute-care treatment at field hospitals in Saudi Arabia and, later, Kuwait.

On another day, they treated five children wounded when a cluster bomb left from the war exploded. Four of them survived.

Throughout it all, in the early days, the Iraqis and the Americans eyed each other with a kind of perplexity, the Iraqis seemingly not sure whether to trust the soldiers who had battled their army and occupied their cities, the Americans unable to comprehend the level of despair that had settled over the war weary populace.

The worst day, said Hatch, was an afternoon when a young mother brought in her infant son, suffering from a severe infection of the soft tissues of the head, which by then had invaded much of the rest of the baby's body. The medics said the only way of saving the baby was immediately transporting him to a hospital in Saudi Arabia.

The mother refused. "I will throw him in the ditch," she told the astounded medics.

The same day, a 16-year-old girl brought in her month-old baby, suffering from severe malnutrition because it apparently had not been fed. "They had an older child who was perfectly well-fed, but the 65-year-old father apparently didn't feed the baby because he figured . . . well, it's the second son; what the hell," Hatch said.

In both cases, the two medics grabbed the babies from their mothers and

since been returned to their parents.

"I don't know if they were frightened of their husbands in the army, or if they thought once we took them they'd never see the baby again, or if they just didn't care," said Hatch. "I think that was the hardest day for me. We had a kid blow his hand off that day, another kid got powder burns on his face. . . . Every day has been a different day, and there are no better days."

A few days later, one of the men who'd helped clean up the clinic brought in his baby daughter, Wisan, suffering from diarrhea, vomiting, pneumonia and malnutrition.

"The baby was a mess," Hatch recalled. "I made her my project. If there was one thing in Safwan that was not going to fail, it was this kid. She had a tube in her arm, a tube in her leg, a tube in her stomach." Hatch fed her through an eyedropper in the mouth for weeks before she pulled out of it and was able to go home.

In the meantime, Hatch and Beaoui turned their attention on the schools in Safwan, which with the help of the two medics and other 3rd Armored Division personnel had opened within a few weeks but which were not attracting children from the streets of the village, where they loitered day after day.

The two medics set up a school lunch program, offering Army rations to whoever attended school all day, and attendance immediately climbed from 40 to 150—and finally 600—a day.

They helped free up several electrical generators that had been seized from the Iraqis and made sure they were set up to deliver power to the local mosque and about 100 nearby houses.

As word of the spare, three-room clinic spread, Iraqis from as far as 300 miles away began showing up for treatment. The Iraqi-controlled hospital at Basra, itself unable to obtain medical supplies, began sending patients to Safwan, and eventually Iraqi authorities signed documents allowing former employees of the clinic to go back to work.

Last Saturday, with the return of Safwan's only physician, the Army officially handed control of the clinic over to the Iraqi staff, which by now includes the doctor, five nurses, a pharmacist, two ambulance drivers and two

"The Americans came, they treated us with fairness and brought us back many of the things the war cost us," said the Iraqi doctor, Taha Hussein. "We feel they're the people who got the town started again."

The two medics said the clinic, and everything that came after it, was a natural outgrowth of the American Army's occupation of southern Iraq.

CLINIC: Medics Battle Hunger, Disease at Iraq Borde

Continued from A1

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Associatec

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"We moved into Safwan. occupied their city. We wer enemy. We carried guns, told ple what to do. But then we lo around and said, 'There's things we could do here,'" H said.

"There was initially a susp 'Why are you doing this? Wh you want?' The answer was, want you to be healthy. We you to be free.'"

Reports Trickle In of the Bombs That Go Astray

Washington Post

Washington

Preliminary estimates of the accuracy of U.S. bombs dropped on military targets in Iraq and Kuwait suggest that hundreds of precision-guided munitions, as well as thousands of "dumb" bombs, have missed their targets and in some cases struck unintended sites, according to U.S. officials.

The only evidence that U.S. officials have chosen to disclose so far, all anecdotal, has been of perfect bomb strikes.

Highlighting the occasional tendency of so-called "smart" bombs to go astray and cause civilian casualties, British officials disclosed this week that a laser-guided bomb had missed its target last week and struck a populated area in the Iraqi town of Fallujah.

In contrast, U.S. defense officials — over the objections of senior Air Force officials — have suppressed a film showing a U.S. smart bomb early in the war accidentally striking a civilian building in downtown Baghdad, across from the Interior Ministry.

Several Pentagon officials, speaking on condition they not be named, said unguided munitions frequently have missed such military targets as bridges or armored revetments, a circumstance that delayed the air war against the Republican Guard forces near the Iraqi-Kuwaiti border.

Independent analysts also note that the allied coalition has been using several types of munitions with poor accuracy records in past conflicts and poor operational test results, including at least one type of guided bomb found to be so inaccurate that its production was halted abruptly six years ago.

Although the Pentagon has declined to release a detailed tally of the munitions used to date, several officials said the smart bombs featured in the videotapes that have been shown during military briefings represent only 5 to 10 percent of the total.

Some Designs Date From '40s

The rest have been simple, steel-encased explosives — including some with designs dating from World War II — that follow unguided, ballistic trajectories to their targets, usually hitting within 50 to 100 feet but sometimes missing by much greater distances.

A potentially wide margin of error in allied bombing was illustrated Monday when U.S. military officials in Washington, seeking to rebut Iraqi claims that a bomb had struck a mosque in Basra, said that although the bomb had missed the mosque, it fell a half-mile from the military command center it was supposed to hit.

A senior U.S. military official in Washington who has seen both still and video pictures of damage from inaccurate bombing said that more bombs have missed their targets in Iraq and Kuwait than political leaders have wanted to admit. But he said it may not be until after the war that a comprehensive estimate of weapons' accuracy can be drawn from a detailed inventory of munitions used in the fighting and associated bomb damage.

Accuracy Rates Vary

Estimated bombing accuracy rates in the Persian Gulf War have been as high as 95 percent for the most advanced types of U.S. guided munitions but lower than 50 percent for many unguided munitions, several officials said.

A total of 110 million to 120 million pounds of explosives have been dropped on targets in Iraq and Kuwait during the past five weeks, a senior Pentagon official said.

The bombs that have missed their targets involve a minority of those dropped in allied air operations, but given the furious pace of combat in the gulf, even the relatively high success rates mean many failures, the officials said.

Allies Back Bush on Deadline

Europeans, Arabs were worried about Soviet plan

By Rone Tempest

Marines Eager to Hit The Beach, Go Home

They say they would rather fight than feint

Associated Press

Aboard the USS Nassau
in the Persian Gulf

Lance Corporal James Hartzog figures the fastest way home is via the Kuwaiti coast.

"Artillery that can range to the beach has to be taken out," LaPlante said.

Possible Tactics

Jenkins said it was possible tha

Riding Out Storm of cism of Gulf War Role

■ **Defense:** Its shortcomings may lead to more cuts, as Pentagon chiefs assess military missions and budgets.

By MELISSA HEALY
TIMES STAFF WRITER

WASHINGTON—For most of the armed services, the Persian Gulf War was more than just a job—it was a chance to strut their stuff and almost every branch emerged from the war with new luster.

The Air Force, for example, all but disproved the post-Vietnam War tenet that air power by itself cannot dictate the outcome of a war. The Army came back confident that its new high-technology weapons were not the duds that critics had claimed. Even the Marine Corps—though mainly left out at sea awaiting an amphibious landing that never came—made headlines: Onshore, the Leathernecks were instrumental in winning back Kuwait city.

Not so the Navy. While Air Force F-117 Stealth fighters dropped precision-guided weapons down carefully photographed Iraqi chimneys, the Navy's pilots were saturating Basra and Kuwait with iron bombs and cluster munitions that brought charges of brutality and unnecessary slaughter of civilians. In early efforts to target bridges in the theater, many of the Navy's unguided iron bombs failed to hit the mark and the Air Force was sent in to finish the job. At least 30% of the Navy aircraft in the Kuwaiti theater of operations was tied up defending the carrier

Please see NAVY, A28

NAVY: Military Service Is Riding Out Storm of Criticism Over War Role

Continued from A1

task forces themselves.

Unfortunately for the admirals, all this comes at a time when the Pentagon's civilian leaders are assessing the missions and budgets of the military services in an effort to cope with the rapid "build-down" of defense spending that Congress has ordered. The dwindling pot of defense funds has set off a scramble among the services to protect and expand their shares. While the Persian Gulf War is not expected to reverse major budgetary decisions, it clearly has provided the Army and Air Force some guarantee that their positions will not erode.

But the blue-water Navy, which already is under orders to cut its fleet of aircraft carriers to 12 from 14, may not be able to fend off further cuts by Congress. Already, Sen. Edward M. Kennedy (D-Mass.), chairman of the Senate Armed Services Committee's sea power subcommittee and a longtime advocate of a smaller carrier fleet, has called hearings on the role of carriers in the Gulf War.

Indeed, five weeks into the war, Defense Secretary Dick Cheney issued a frank warning to the sea service to keep its head down. "You still only get 450 ships, Dan," Cheney told J. Daniel Howard, the Navy's civilian second-in-command, in an offhanded comment during a Washington speech.

To be sure, not all the shortcomings cited in the Navy's Gulf War performance are as serious as they sound. Although concerned about the public relations aspect of such charges, Navy officials argue that many of the criticisms are easy to remedy—and are already in the works. For example, increasing the stockpile of "smart bombs" requires only the purchase of inexpensive "kits" that enable pilots to guide iron bombs to their targets by lasers.

And the admirals maintain that the Navy could expand its role for future operations by employing the proposed new AX aircraft, which are designed for both fighter and bomber missions. The AX—a restructured version of the A-12 that Cheney recently canceled—would replace the aging A-6 aircraft with a longer-range, more versatile aircraft than the Navy was able to field in the Gulf War, using Stealth (radar-evading) technology. Last week, the service won Cheney's approval to develop the AX.

Moreover, the Navy's defenders contend that the carrier action—though long regarded as the cornerstone of the modern Navy—was only a small part of the service's overall contribution to the Gulf action and that to judge the Navy solely on its performance during the air and ground war understates its role. "We were out doing our own thing—interdiction operations and contributing to the air war," one naval officer says.

There are these examples:

—Naval interception of Iraq-bound shipping during the first six months of the U.S. deployment helped whittle Iraq's supply lines and cripple the Iraqi economy. By the time the shooting war began, Iraqi forces had lost most of their supplies and spare parts.

—Navy sealift ships, while criticized initially as inadequate and too slow, carried 95% of the enormous U.S. military cargo to Saudi Arabia. And Marine equipment prepositioned aboard Navy warehouse ships was among the first heavy arms to arrive in the theater.

—Moreover, many credit the arrival of the aircraft carrier Independence in the Gulf of Oman on Aug. 7 with dissuading Iraqi forces from lunging farther south toward Saudi Arabia. That same day, the aircraft carrier Dwight D. Eisenhower moved through the Suez Canal, bringing 164 aircraft within striking range of Iraq.

—And once the shooting began, the Navy aircraft—which had been assigned to protect the fleet as well as the flanks of the land operation—were necessarily cast primarily in a supporting role.

Barry Posen, a defense analyst at the Massachusetts Institute of Technology, concedes that "it does not look like the Navy's contribution on the offensive side was very important to this war." But he argues that the Navy simply has not prepared itself for offensive bombing missions.

"Look at what exactly Navy air has been training and buying munitions for all these years," Posen says. "Their idea is that they steam around in the open oceans and attack naval targets ashore, such as ports and naval airfields, that they fight other people's navies at sea and defend their carriers and amphibious forces from assault. The kinds of missions the Air Force does—the offensive bombing that seemed to make such a difference here—this is stuff they're just not very interested in."

In spite of the Navy's reluctance to operate its carriers in constrained waters, such as the Persian Gulf and Red Sea, the service had moved six carriers—half the carrier force that is expected to survive the Pentagon's planned budget cuts—within striking range of Iraq by Jan. 21.

But its aircraft still made up fewer than 16% of the overall air forces in the theater, and they dropped only a tiny fraction—well under 10%—of the "smart bombs" that appeared to make such a difference in the outcome of the war.

Indeed, one of the Navy's most sparkling offensive achievements—the first-ever firing of Tomahawk cruise missiles from Navy ships in the opening days of the war—has sparked debate inside the Navy and out.

At $1.35 million apiece, each Tomahawk dropped the equivalent firepower of a $100,000, 1,000-pound bomb—with an accuracy that was outstripped by other aircraft in the theater. Navy planners say that the cruise missiles could be used day or night on targets and in weather that no current aircraft would brave. But one military planner still scoffs that the use of Tomahawks in the Gulf War was "a circus stunt" on a par with the Air Force use of F-117 Stealth fighters during the 1989 Panama operation.

Among some Navy officers, the successful use of the Tomahawks rekindled long-held fears that the unmanned cruise missiles would undercut the rationale for new carrier-based aircraft like the A-12.

"The problem the Navy created for itself," MIT's Posen says, "is that [it] proved that many of the targets you would customarily have allocated to a deep-attack aircraft can be successfully engaged by a Tomahawk, which can be widely distributed across the fleet. To the extent that that's true, you undercut the argument that you need large-deck carriers."

"That may be a hard lesson for the Navy to swallow," Posen adds. "You could argue that Tomahawks put the last nails in the coffins of the A-6 and the A-12 strike aircraft."

Not surprisingly, the Gulf War travails—and the new budget realities—have sparked an agonizing reappraisal by some veteran officers.

Retired Rear Adm. Eugene J. Carroll, a former carrier skipper who is deputy director of the Washington-based Center for Defense Information, warns that the Navy may be sowing the seeds of its own future weakness. Its reluctance to restructure the fleet for

Please see NAVY, A29

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SUMMER TERM BEGINS JUNE 10

NAVY: Critics Pointing to Shortcomings in Gulf War

Continued from A28

smaller, regional battles in constrained waters, such the Persian Gulf, may weaken the service's ability to compete in the budget battles to come, Carroll says.

"In its procurement program, the Navy is clinging to the image of an enemy that is very imposing, very advanced," Carroll argues. "We have to have subs that can hunt their subs under the ice, Stealth aircraft that can sneak up on them, ships that can spot attackers at 200 miles [away] for the big, blue-water slugfest in which the best systems will prevail. We just don't have a navy that's tailored to fight regional conflicts at an affordable cost. And if we keep buying these high-tech marvels, we're going to price ourselves out of the competition with the Air Force, the Army and the Marine Corps."

And, in a recent joint article in the Naval Institute Proceedings, the secretary of the Navy, the chief of naval operations and the commandant of the Marine Corps, which is a part of the Navy, outlined a definitive blueprint which argues that the Navy must shift some of its emphasis from open-ocean operations to handling missions in more-constrained waters, such as the Persian Gulf. "We must reshape naval force structure, strategy, tactics and operating patterns that are wedded too closely to the concept of an Armageddon at sea with the Soviet Union," they wrote.

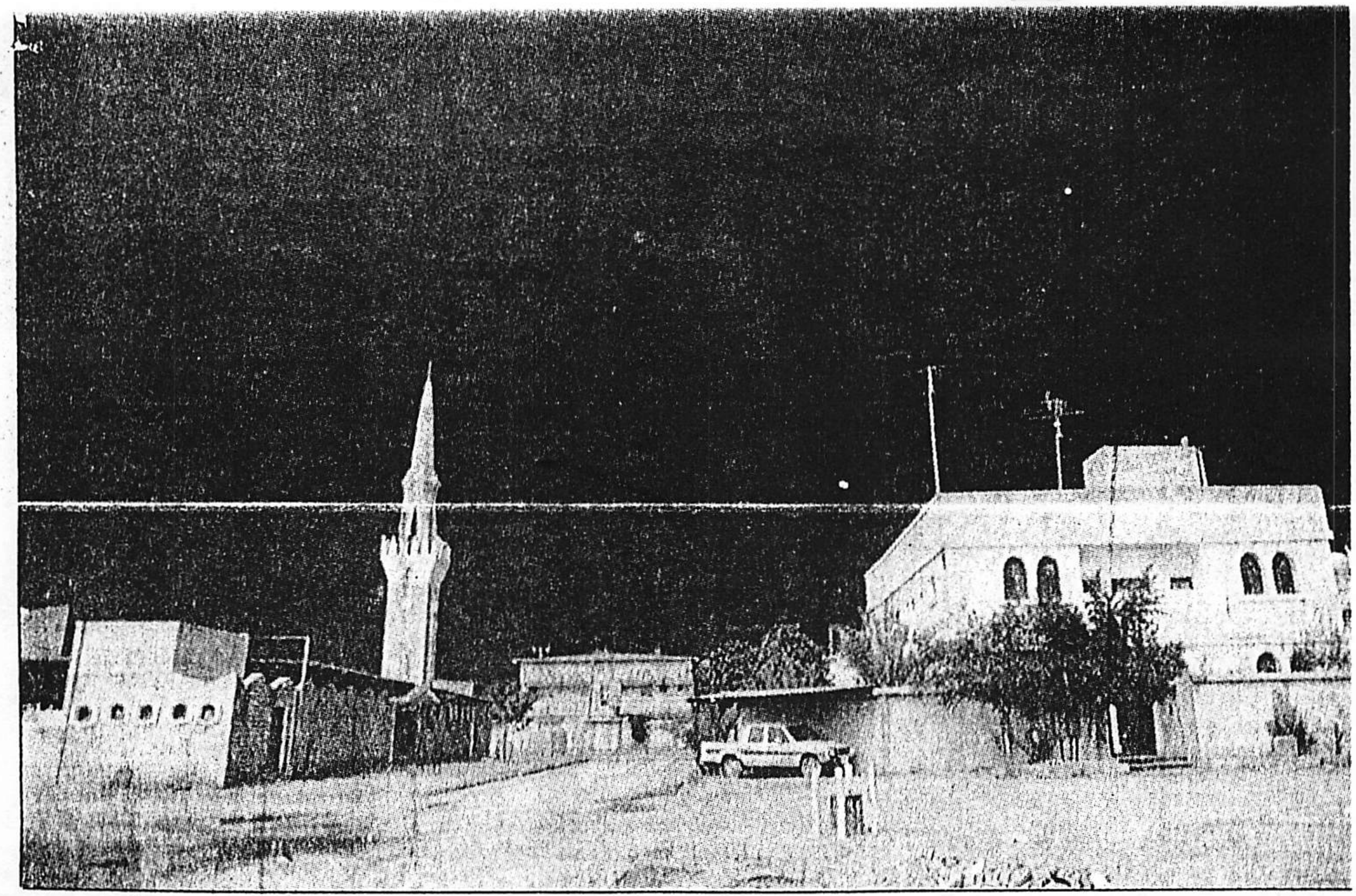
Most threatening to some tradition-minded sailors, the three officials warned that as the number of aircraft carriers dwindles, the service will have to operate with smaller battle groups designed around cruisers, battleships and amphibious ships rather than carriers.

Indeed, the Navy—never keen to subordinate its operations to larger, multiservice undertakings—is "very distinctly and clearly embracing jointness [joint-service cooperation]," one naval planner says.

"That's a real change for the Navy," he adds. "We really do have to work together. Some of the old guys in their heart-of-hearts feel that the Navy should still be able to go it alone but we're more professional than that. Besides, there'll be times when we're out there by ourselves."

At the same time, however, with so much invested in its blue-water fleet, the Navy is wary of "getting too carried away" by the lessons of the Persian Gulf War, according to one senior Navy official.

"We'd better be careful about what lessons we learn," Howard cautions. "Things worked extraordinarily well but, if there's one thing we know with certainty, it's



At high noon in the Saudi border town of Khafji, smoke from burning oil facilities in Kuwait turned the sky as black c

U.S. Dropping Napalm On Iraqi Fortifications

Marines take many prisoners in fierce battle

Chronicle Wire Services

Dhahran, Saudi Arabia

Waves of U.S. planes dropped napalm on Iraqi defenses yesterday, and the U.S. Second Marine Division killed "numerous" Iraqi soldiers and captured at least 81 soldiers in its fiercest battle of the war.

Photographers near the front watched Marines load canister after canister of napalm — one of the most controversial weapons of the Vietnam War — onto combat support aircraft, which then streaked off to the north.

Lieutenant Commander John Tull, a Central Command spokesman, said that the flammable gel was being used only to destroy oil trenches.

"It is not being used on personnel," he said.

However, a senior Marine officer, who asked not to be named, said napalm's role in combat was to reach entrenched troops, "just like in Vietnam."

An American magazine photographer, who requested anonymity, said pilots told him that they had been using the jellied gasoline on "bunkers and artillery positions" and other emplacements.

One pilot said napalm has been used in bombing raids for about a week.

The Marine battle began Thursday when a reconnaissance unit ran into Iraqi mortar and artillery fire along the Kuwaiti border, a Marine spokesman said.

The Marine spokesman, Lieutenant Colonel Jan Huly, said U.S. artillery and air attacks destroyed two tanks, probably knocked out four to five others and hit four ammunition trucks. An Iraqi artillery position was also hit.

Huly said "numerous" Iraqi troops were killed. Two Americans were wounded, but he did not know the extent of their wounds.

The captured Iraqis threw down their weapons after the tanks accompanying them were destroyed, the military said.

The U.S. Central Command reported that one Marine was killed and five wounded yesterday, but it

The Bombs That Go Astray
SEE PAGE A9

Back Page Col. 5

TWO PLANS FOR IRAQ'S WITHDRAWAL

United States

- Begin large-scale withdrawal from Kuwait **by noon EST on Saturday.** Complete military withdrawal in one week.
- Within **48 hours,** remove all Iraqi forces from Kuwait City and allow the prompt return of Kuwait's legitimate government. Withdraw from all prepared defenses along the Saudi-Kuwait and Saudi-Iraq borders, from Bubiyan and Warba Islands, and from Kuwait's Rumaila oil field.
- Within **one week,** return all Iraqi forces to their positions of August 1.
- Within **48 hours,** release all prisoners of war and third-country civilians being held against their will and return the remains of dead servicemen.
- Remove all explosives or booby traps, designate Iraqi liaison officers to work with coalition forces on the withdrawal and provide the location of land and sea mines.
- Cease combat aircraft flights over Iraq and Kuwait except for transport aircraft carrying troops out of Kuwait, and give coalition aircraft control of Kuwaiti airspace.
- Cease all destructive actions against Kuwaiti citizens and property and release all Kuwaiti detainees.

Soviet

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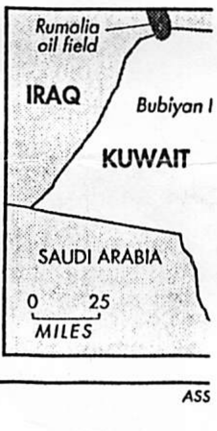


ASS

3-Year-Old Survives Freezing Night in East Ba

'As cold as he was, he should have been dead,' doctor

By Erin Hallissy

Chronicle Correspondent

Levi's and tennis shoes. He was lying face down about 50 yards

the degree of hypc
he should have g

rch for a negotiating part- the Soviets, the Iranians, Arabs — to intercede with ed coalition.

e are his previous claims wait is an inseparable part that justice for Palestini- Lebanese must be linked lement of the Persian Gulf r even that foreign troops thdraw from the region at e time as an Iraqi pullback.

hat he demands now is for get out of Kuwait and for ns to be removed. It is a g reversal — in effect, nalysts say, a capitulation.

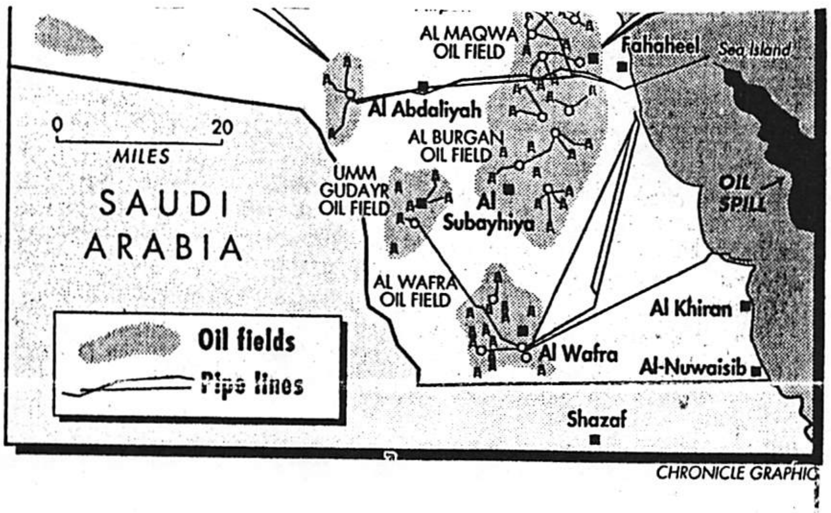
ction in Army

ough information from in- ghdad's ruling circle is and unreliable, Iranian iet sources have told Euro- rnalists that Saddam faces resistance from his com- s and division within his rusted ruling group of a en men. The sources say ree-day delay in respond- he first Soviet peace pro- emmed from these divi-

personal control Saddam e able to wield over com- in the field — there are ccounts of him swooping units during the Iran-Iraq order executions — has d to the point where some t is safe to voice opposi- structure of surveillance ession has been damaged oint where British intelli- urces say desertions are g even among the elite Re- Guard.

recently, British military Lawrence Freedman ut, Saddam had counted se well-entrenched, well- l ground troops as his fi- in a game of nerves with t Bush. Skilled and expe- in defensive warfare, ces were poised to inflict n losses against an allied

Hmm..
Where are my sheepskin seat covers?



CHRONICLE GRAPHIC

U.S. DROPPING NAPALM

From Page 1

was unclear if those casualties occurred in the same incident or in other skirmishes along the border.

Air Attacks Focus on Kuwait

While the allied gunners hammered forward positions with artillery, allied planes flew 1,000 sorties into Kuwait alone, and 100 others targeted Saddam Hussein's Republican Guard, the U.S. command said.

Altogether, coalition aircraft flew 2,700 sorties against lines of communications and battlefield targets despite mixed weather patterns that grounded some helicopters, Brigadier General Richard Neal said.

Tehran Radio reported yesterday that allied planes bombed the outskirts of Basra, starting fires in the Iraqi city that were visible 12 miles away in Iran.

U.S. officials accused Iraq of deliberately torching Kuwaiti oil installations as part of an "orchestrated, systematic" attempt to paralyze the embattled emirate's production capability.

Greasy black plumes rose over more than 140 of Kuwait's 950 oil wells. The border town of Khafji, battered in an early ground battle, took on an especially eerie cast against a backdrop of dark haze. At midday, the town was as dark as night.

Neal said the thick veil of smoke over Kuwait would obscure the battlefield and hamper some air operations, but it would not impede the overall ground campaign.

"We are prepared for this," he said.

Civilian Scud Shields

The Pentagon yesterday also said Iraq is now using civilians to shield its Scud missile batteries.

Lieutenant General Thomas Tom Kelly told a press briefing that three Scud missiles fired Thursday in the direction of King Khalid Military City in Saudi Arabia "came from within Baghdad city limits."

"From that, we derived that the Iraqis are using the civilian population to guard their Scuds," Kelly said.

The missiles landed harmlessly in the desert.

Air raid sirens warning of a possible Iraqi missile attack sounded in Dhahran in eastern Saudi Arabia early today, witnesses said, but there was no word as to whether the missiles had actually been fired.

Neal alluded to an allied ground assault when he quoted General Norman Schwarzkopf, the U.S. commander in the gulf, as saying: "U.S. forces are fully prepared for execution of any action ordered by the president of the United States."

Troops Support Ultimatum

And in desert foxholes and on assault ships in the Persian Gulf, troops exuded a boisterous confidence and support for President Bush's ultimatum that Iraq begin withdrawing from Kuwait by noon EST today.

"It's about time we do something," said Air Force Staff Sergeant Trent Maness, 27, of Selmer, Tenn. "They either move out or face the consequences. We've been carrying this on too long now, as it is."

Far back in Dhahran, Sergeant Andre Prado, a California National Guard MP from Los Angeles, said a ground war would end his easy job of searching hotel guests.

"I just want to get it over with, one way or the other," he said.

No Quebec Referendum

Montreal

Quebec Premier Robert Bourassa has ruled out a referendum this year on the French-speaking province's future.

Reuters

The Mind of a Missile

The cruise missile, triumphant in the gulf, is a techno-marvel that almost didn't get out of the lab

THE WAR
DEADLY SCIENCE

Kathi Crebo heard the beginning of Operation Desert Storm through an office wall. A supervisor at General Dynamics' Convair Division plant in suburban San Diego, Crebo was leading a training class when a cheer erupted from the factory floor. The workers who assemble the Tomahawk cruise missile finally knew that their product worked. Over the next few days, exultation would alternate with sober reflection. "Most of us know people who are over in the gulf," Crebo says, "and we didn't want a lot of laughing and joking." Suffusing everything, there was pride. The daughter of a General Dynamics worker heard about the Tomahawk strikes and said, "My daddy touched that."

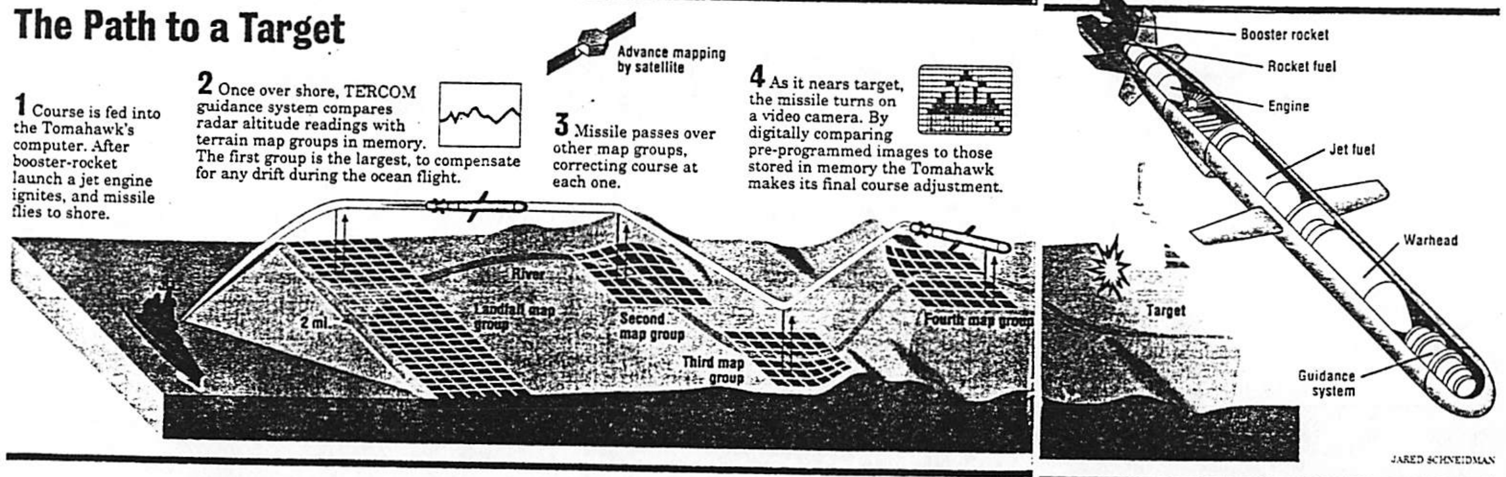
The celebrations had been a long time coming. It's been almost two decades since the first cruise-missile contract was issued, and the program often seemed close to crashing. "We've been through a soap opera. There would be hope, then despair," says Frank Thompson, General Dynamics' Tomahawk director. "I can't count the times we thought the program had no possibility of going forward."

Now the Tomahawk seems to be giving new meaning to the term guided missile, with an accuracy that the CNN-addicted public has found breathtaking. Of the first 52 Tomahawks fired, the military reported 51 hit home. By the end of the war's third week, some 300 of the $1.3 million Tomahawk cruise missiles had been fired at Iraq. Officials told Congress that the Tomahawks have been more than 85 percent effective in destroying their targets, exceeding the performance the missiles registered in tests. Outside experts question whether these figures are inflated, and no one will really know how well the Tomahawk did for months to come. But in its first test in battle, the early reviews hail the Tomahawk as a high-tech weapon that could change the nature of battle forever.

In the simplest sense, the cruise-missile story is about science and technology—miraculously small jet engines and onboard computers that get the Tomahawk from launch to target. But it is much more than that. It's also a story of budgets and bureaucracies; of loose screws and driven people. The tale sheds light on the workings of—and complex relationships between—the research labs, defense manufacturers, the Pentagon and Capitol Hill that make up what former president Dwight D. Eisenhower called the military-industrial complex. What it shows is that American knowhow can make good on its promise of dazzling, "cleaner" weaponry. But it also shows how much can be wasted—money, time, even careers—in the difficult birthing of the arsenal of the future.

How It Works: The Tomahawk cruise missile (for jargon buffs, the BGM-109) is a 20-foot-long weapon that literally has its own mind—though programmers tell it what to "think" before it is launched. It owes its success to the cooperation of several guidance and propulsion systems. On a typical flight, a booster rocket shoots the missile off a ship or submarine with a thunderous 12-second burn. Then its turbofan engine takes over and the missile jets toward land, directed by its "inertial-guidance system." Almost old-fashioned by today's standards, inertial guidance uses sensors and gyroscopes to measure acceleration and changes in direction. Once the missile crosses the shore, a more precise guidance method, TERCOM, clicks in (chart). It finds its destination the way most of us do—not by reading a map but by recognizing familiar sights along the way. This Terrain Contour Matching system scans the landscape at set checkpoints, taking altitude readings and comparing them to map data in its computer memory. The missile scoots along at about 550 miles per hour and can be programmed to hug the terrain at less than 100 feet like a radar-evading fighter plane and to make unpredictable twists and turns.

The Path to a Target



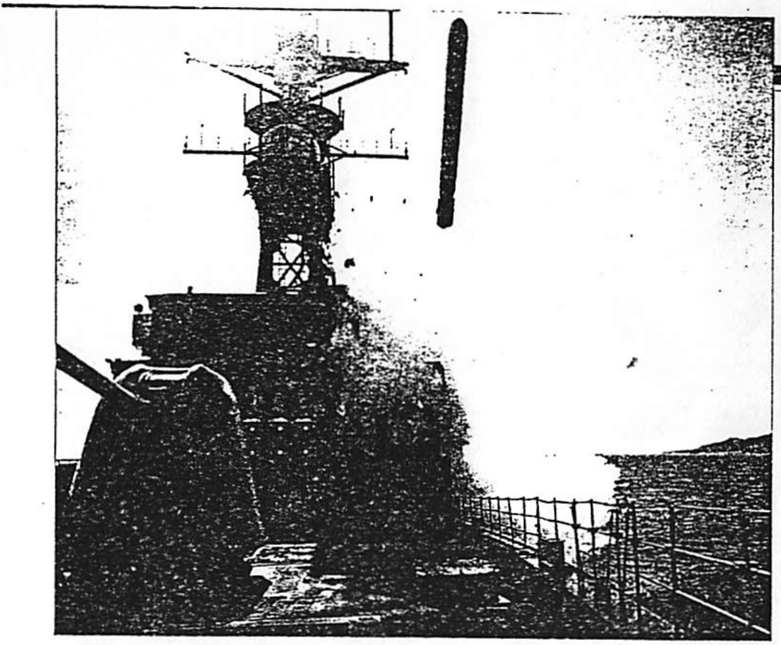
1 Course is fed into the Tomahawk's computer. After booster-rocket launch a jet engine ignites, and missile flies to shore.

2 Once over shore, TERCOM guidance system compares radar altitude readings with terrain map groups in memory. The first group is the largest, to compensate for any drift during the ocean flight.

3 Missile passes over other map groups, correcting course at each one.

4 As it nears target, the missile turns on a video camera. By digitally comparing pre-programmed images to those stored in memory the Tomahawk makes its final course adjustment.

JARED SCHNEIDMAN



In a 1980 test, a cruise missile is fired from a launcher aboard the USS Merrill

After covering as much as 1,500 miles, the Tomahawk closes in on what its engineers prosaically call the "terminal end point," and the third guidance system takes over: DSMAC (Digital Scene Matching Area Correlator). "Deesmac" snaps a picture of the target area and compares that digitized data to a version in memory. The computer gives the stubby wings and tail fins a final adjustment, bringing the warhead to the target with unnerving accuracy. Thanks to this three-stage process, "we feel we could launch a [Tomahawk] from Boston Harbor aimed at RFK Stadium and we'll put it between the goal posts," says Bob Holsapple, a spokesman for the Navy's Cruise Missile Project. Depending on which version of the Tomahawk has been launched, it will carry either a 1,000-pound high-explosive Bullpup warhead or a cluster of 166 soda-can-size "bombiets" that can be dropped over three targets en route to a fourth. (Other versions carry nuclear warheads and are not in use in the gulf.)

This is a far cry from a cannonball. But it was inevitable that warriors would someday give their projectiles engines of their own. Greater range and precision are "force multipliers"—military jargon for getting more bang for the buck. Two technologies competed for the future. One sends the rocket high into the air, describing a path that, with calculation of the ballistics, reaches the target. The other turns the missile into a pilotless plane that flies to the target.

A 46-Year Birth: The Germans began launching cruise precursors in 1944; the lumbering V-1 bore a one-ton warhead, a maximum speed of 400 miles per hour, a range of about 200 erratic miles. Germany also had a ballistic missile, the V-2. Author Thomas Pynchon captured the promise and terror of this new science of war in "Gravity's Rainbow," a book whose title describes the rocket's arc. Pynchon boils it down to one wicked limerick:

There once was a thing called a V-2,
To pilot which you did not need to—
You just pushed a button,
And it would leave nuttin'
But stiffs and big holes and debris, too.

Ballistic missiles soon gained the edge, with early defense-sponsored computers performing their arduous calculations. Though the Air Force and Navy tried pilotless aircraft with curiously comical names like Snark, Navaho, Hound Dog and Regulus, the hapless crafts would stray miles off course.

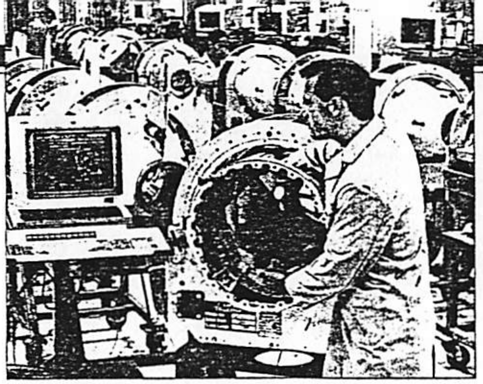
Inadequate technology wasn't the sole reason the military initially scoffed at cruise missiles. The lowly drones had no place in the wish list of each service. The Air Force wanted fast-moving ballistic missiles and new generations of heavy bombers to carry its multimegaton nuclear warheads. The Navy wanted Polaris submarines and aircraft carriers. The cruises were not just a sideshow; they were seen as a threat to these grander visions. A cheap unmanned craft might deliver the payload as well or better than a piloted plane. That lurking prospect kept the military hostile to the cruise—and all but out of the cruise business for most of the 1960s.

But the Soviet Union was still in it. After the six-day Arab-Israeli war, American defense strategists were stunned when Egypt sank the Israeli destroyer Eilat with Soviet-made SS-N-2 Styx cruises. Soon after, the Navy ordered up anti-missile sys-

Tomahawk

tems and the Harpoon antiship cruise missile. Even then, the brass tethered it with a 60-nautical-mile range, leaving the long-distance attacks to the flyboys. For similar reasons, the Air Force later canceled development of an unmanned decoy plane; the brass saw that it could be converted to a cruise and hurt the chances for the proposed B-1 bomber.

By then the cruise idea was almost unkillable. Congress in 1971 appropriated a mere $10 million for early research on long-range cruise missiles. John Lehman, a Reagan-era Navy secretary, says the cruise is a "classic civilian weapons system . . . invented by civilians and kept alive by civilians because it never fit into the services' agendas." While the cruise was hated at the top, some members of the military saw its potential. Like any program that must take on the Pentagon brass, this one needed a champion within the ranks willing to risk his career and brave the bureaucracy.



Assembling components on the cruise production line

A Dream for Contractors

Not only is the main contract for the Tomahawk split between General Dynamics and McDonnell Douglas; dozens of subcontractors supply parts. Among them:

Honeywell: The Minneapolis-based company's Military Avionics Division makes the missile's microwave-radar altimeter. It is similar to the systems used on the Navy's F-14A Tomcat and A-6E Intruder. The company has also developed a ring laser gyroscope that may figure in a planned upgrade of the Tomahawk.

Williams International: Engineer Sam Williams began developing small turbine engines while working in the automobile industry. Now his company's astonishingly small, fuel-efficient engines can be found in Air Force and business aircraft—and the Tomahawk.

Litton: The Beverly Hills-based electronics manufacturer provides part of the inertial guidance system that steers the Tomahawk from its submarine or ship-based launcher to land, where the TERCOM navigational system comes into play.

The Man Who Saved It: Walter Locke was a maverick by military standards. Most ambitious sailors take rotations of sea duty and staff posts to work their way up the ranks, but Locke pursued a master's degree in electrical engineering and began learning the ropes of weapons-system management. Then in the summer of 1971, a Navy personnel officer gave Locke, who was then a commander, a choice of two duty stations: a juicy command slot or some "flaky project" foisted on the Navy. It was the cruise-missile project, and, to the officer's consternation, Locke jumped at the chance. "I saw we had a revolution here," Locke recalls.

When Locke took over, Navy colleagues were putting down bets that the cruise-missile program would be dead within a year, and his superiors told him to aim the research at something that the Navy might use for other weapons once the cruise was canceled. But Locke was blunt and willful. Says Larry Smith, an aide to House Armed Services Committee chairman Les Aspin and a longtime cruise follower, "He was like a football tackle who never goes for the fake. He just keeps coming after you." Before long, Locke developed patrons. Secretary of State Henry Kissinger was shopping for a bargaining chip he could use in the second round of the Strategic Arms Limitation Talks (SALT II). Sea-launched cruise missiles (SLCMs or "slickems" as the services would call them) were ideal weapons to throw away later in exchange for Soviet concessions. Kissinger pressed the Pentagon to keep the Tomahawk alive. The second patron: Deputy Secretary of Defense William P. Clements, a blustery oil tycoon who would later serve two terms as governor of Texas. While he knew next to nothing about national defense, cruise missiles played to his soft spot for high-tech wizardry. Locke began slipping Clements back-channel briefings on the weapons to pique his interest and Clements built a bureaucratic wall around the program to protect it from Navy long knives.

The timing was right for a return to cruise technology. By the 1970s the technologies of guidance and propulsion were catching up with ballistics. Powerful jet engines could be made small and light. Sam Williams, a former Chrysler engineer working in Walled Lake, Mich., had been tinkering with fuel-efficient turbofan engines and came up with a tiny, 130-pound wonder. Reliable guidance systems like TERCOM, patented in 1958, could now be shrunk. The military's hostility might even have helped the project, keeping it more simple than the specification-laden pet projects of the top brass: initial requirements for the missile took up a single page.

Locke put together a highly motivated team—and then proceeded to break many of the rules of standard operating procedure that the Pentagon holds dear. Other programs fill key positions with engineers, but Locke tapped business-savvy Navy supply-corps officers. Rejecting the rigid structure of most military organizations, Locke let his officers roam until they found a niche. And while programs usually study systems for many years before building prototypes, Locke rushed models into production and testing—a "fly before you buy" approach that Locke thought would keep the project flexible. Locke and his team also grilled potential contractors mercilessly, a remarkable change from the usual cozy relations. He settled on two main contractors by 1976: General Dynamics would design the missile and McDonnell Douglas would come up with the guidance system.

The False Starts: By the mid-1970s the Tomahawk's political base was firm. Military reformers like Sen. Gary Hart would stump for the cruise and President Jimmy Carter would cite its potential in canceling the B-1 and arguing against building more aircraft carriers. But trouble came from a new direction: within. By the summer of 1982, 17 of the 32 test firings of the submarine-launched missile failed, some spectacularly. In July 1978 two submarine-launched anti-ship SLCMs dropped back into the Pacific as Defense Secretary Harold Brown watched. In 1980 an off-course test missile set off a brush fire in Los Padres National Forest; another came within miles of residences in Ojai, Calif.

General Dynamics came under fire for the multimillion-dollar duds. In 1981 and 1982 the Pentagon slapped the company with six reprimands for poor quality control—even citing loose screws and faulty wiring. Meanwhile, the press (including NEWSWEEK), outside defense analysts and congressional investigators began raising

(Continued on page 43)

(Continued from page 42)

troubling questions about the missile's guidance system and engine power. The debate over arms control had made the cruise controversy all the hotter. As President Carter struggled to get the SALT II treaty ratified, conservatives refused to let cruises be negotiated away, while liberals said the easy-to-conceal cruises would make verification impossible. Says aide Smith, "This new technology got caught in all kinds of cross-fires."

So did Locke. Patrons like Clements had moved on, and the burgeoning multiservice program had grown hugely complex. Pentagon officials complained privately of Locke's management style. "He forgot who he was working for," complained one Navy source. "People in the blue-suit community felt he wasn't playing with them straight." In August 1982, Locke, by then a rear admiral, got the ax.

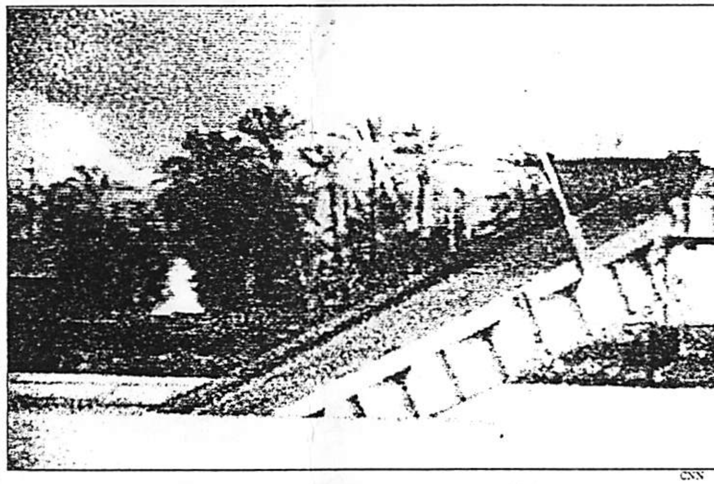
Getting the Bugs Out: The new program manager, Rear Adm. Stephen Hostettler, immediately halted all cruise-missile testing for almost a year and ordered the contractors back to their drawing boards while he restructured the program. Navy Secretary Lehman, who describes himself as a "red-hot Tomahawk booster," made some politically shrewd moves. He worked the cruises into his own pet project—returning mothballed World War I-era battleships to active service. By promoting battleships as an ideal platform for the cruises, he got Congress and the Navy brass on board.

The Lehman contribution that truly saved the cruise was competition—in military jargon, dual-source procurement. The Pentagon forced General Dynamics to share the contract with another supplier, McDonnell Douglas. The two companies would share their technology and then compete on price and performance for the larger share of each year's missile order. General Dynamics didn't want to share its contract—which only makes up 3 percent of the company's business—but the Pentagon left it no choice. "He was the stick *and* the carrot," says General Dynamics' Thompson. The result was dramatic. The flight-test problems all but disappeared, and the program's price plunged by an estimated $3 billion. At McDonnell Douglas's Titusville, Fla., plant, program director Charles Hoover insists that the success of dual sourcing is as much "partnership" as competition. "Sure, we want to win a bigger piece of each year's contract," he says, but "I don't think this missile program would be as successful as it is if the entire relationship with General Dynamics was adversarial. Rather, it's like another set of eyes watching what you're doing—we audit each other."

Despite the improvements, the missile still didn't see action for another few years. Defense planners refused to consider the Tomahawk for the strike mission against Libya's Col. Muammar Kaddafi in 1986. While some Pentagon sources say that the Air Force had insisted that its F-111 fighters get the glory, it's also possible that the brass didn't yet trust the Tomahawk's accuracy. A 1988 report from the General Accounting Office accused the military of fudging tests to improve performance—even painting targets to increase the likelihood of a hit.

The Tomahawk's performance in the gulf has gone a long way to dispel the doubts. "I think we can safely tell them to blow it out their ears," says Allen Talbot, a 52-year-old guidance-system assembler at Titusville. Yet doubts persist. The military had five months to map and plot targets; other conflicts might not provide that luxury of time for the laborious software work. And outside experts have accused the military of massaging its numbers. Western journalists in Baghdad have filed unconfirmed reports of Tomahawks striking civilian targets or getting shot down by antiaircraft fire. The Pentagon's claims of an 85 percent success rate could mean that most targets assigned to the Tomahawks have been destroyed—but it might have taken more than one Tomahawk to hit them. Former secretary Lehman tells NEWSWEEK that Pentagon officials admitted the single Tomahawk's overall success rate was closer to 66 percent. And an enemy with better air defenses might stop even more cruises.

Some of these problems will be tackled in future generations of the cruise. The Block III version, scheduled to appear in 1993, will sport faster computers that take less time to program than the present version, which is less powerful than the most basic off-the-shelf PC. Says John Pike, director of the Space Policy Project at the Federation of American Scientists: "For all the talk about these smart weapons, they're mostly old . . . There's a saying in the computer industry: when it finally works, it's obsolete." By 1993, cruises will also carry Global Positioning System receivers, the satellite-based navigation system gaining wide use in military and civilian life, as well as upgrades for the digital scene-matching system and some Stealth technology. The next missiles will even have a time of arrival control: attack planners can coordinate cruise strikes for, say, minutes before planes arrive. If it's going to be early, the missile knows to dawdle long enough to reach the target on time.



CNN

A bridge in Iraq that was reportedly destroyed by a cruise-missile hit last week

The boy-toy glow surrounding high-tech weapons can obscure war's gory questions. But the cruise's fans say it actually prevents bloodshed. "If not for all the work here," says Walt Kurgas, a Titusville manager, "there would have been a lot of lost planes and a lot of POWs." Not everyone is convinced yet. "The war has made a stronger claim that high technology can work—but so far, only on the gadget level, the Nintendo level, not the strategic level," says Pike. "If the war ends with less than 1,000 Americans dead and victory, that's one thing. But if there are 8,000 dead and Saddam is still in Baghdad, people will say, 'Wasn't high tech supposed to eliminate this?'" It was. It still might. But if it doesn't, spirits might not fly so high in Titusville.

JOHN SCHWARTZ *with* DOUGLAS WALLER *in Washington.* JOHN TALIAFERRO *in San Diego.* TODD BARRETT *in Chicago.* TIM PADGETT *in Titusville and* MICHAEL ROGERS *in San Francisco*

COLUMN ONE

High-Tech Warfare— A New Era

■ The success of the once-controversial Tomahawk cruise missile is emblematic, experts say, of improvements in electronic weaponry. But many remain skeptical.

By SARA FRITZ
and RALPH VARTABEDIAN
TIMES STAFF WRITERS

WASHINGTON—When the first Tomahawk cruise missile hit Baghdad at 3:01 a.m. Thursday, it ushered in a new era of warfare in which U.S. forces take advantage of sophisticated electronic weaponry developed since the Vietnam War to strike their targets with unprecedented precision.

In its wartime debut, the Tomahawk appears to have proved every bit as accurate as its proponents have long insisted it would be. According to Navy officials, more than 90 of the 100 missiles fired from U.S. warships in the Persian Gulf hit their targets in Iraq.

The success of the Tomahawk was emblematic, to many military experts, of the vast improvements made in electronic weaponry over the past two decades. If the early reports of such successes are borne out, that could mitigate the costly failures of high-technology weapons programs that have become so controversial in recent months.

Many weapons experts and even defense executives were cautious Thursday in trumpeting the weapons' success, because preliminary reports often do not stand up under close scrutiny—and because the fighting has just begun. The missile attack launched against Israel early this morning made it clear that Iraq has not been crushed just yet.

The battle against Iraq is hardly the ultimate test of American equipment that was designed to fight the technically advanced forces of the Soviet Union. Nonetheless, the completion of 1,000 bombing sorties by U.S. and allied fighters in the first day of fighting in the Persian Gulf War with just one American loss is considered a tremendous success by itself.

"If we can come back with minimum losses, that shows that technology pays," said Ben Rich, who retired two weeks ago as the head of Lockheed Corp.'s "Skunk Works," its famed secret aircraft unit in Burbank. Although Rich remains cautious about jumping to quick conclusions, it appears that

Please see CRUISE, A9

Associated Press

The pilot of an F-4 Phantom fighter-bomber is welcomed back with a handshake from a ground crew member after returning from a raid on Iraq.

Pilots Relive 1st Combat: 'Most Scary Thing. . .'

By KIM MURPHY
TIMES STAFF WRITER

DHAHRAN, Saudi Arabia—They lifted off on a moonless night on runways etched in the Arabian desert from the Persian Gulf to the Red Sea, bound for a rendezvous in Iraq that would mark the beginning of war.

The aerial armada that sped toward Baghdad just after midnight Wednesday played out a deadly ballet choreographed to tip
the combat balance in favor of
alli forces in the gulf even before
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ma a new chapter in the most
tim saga of warfare: a man, a
ma and a faceless enemy.
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Allied Raids Achieve 2 Goals but Miss Scuds

■ **Military:** Air dominance is established over Iraq, and many vital sites are hit. But some missiles evade attack.

By JOHN M. BRODER
TIMES STAFF WRITER

WASHINGTON—The opening day of the air war against Iraq apparently succeeded in two of its key objectives—the establishment of air dominance over Iraq and Kuwait and the destruction of many critical military and industrial facilities, military officials said Thursday.

But a critical Iraqi capability—its medium-range Scud missiles that were used to attack Israel early today—evaded the U.S. aerial onslaught.

Allied warplanes responded immediately to Iraq's launching of Scud missiles against Israel, taking retaliatory raids against the surface-to-surface missile launchers that are among the most difficult military targets in Iraq.

"This particular effort, to go after those missiles involved in the attack on Israel, is a new mission," Pentagon spokesman Pete Williams said.

Although the Iraqi missile attacks failed to draw Israel into the war, they succeeded in puncturing a mood of near-invincibility among U.S. war strategists after the first night, during which allied warplanes met little resistance when they went after 159 targets in Iraq and Kuwait.

Among those targets were President Saddam Hussein's bunker and residence in Baghdad, said Rep. Bill Dickinson (R-Ala.) after a briefing from Gen. Colin L. Powell, chairman of the Joint Chiefs of Staff. Powell told lawmakers that the two sites were on the list because of command-and-control facilities at each place, but there was no reason to believe that Hussein was present at the time of the attacks.

Dickinson quoted Powell as saying: "We're not chasing the guy. We're going after military targets."

Before the Iraqi missile assault on Israel, U.S. officials said that fixed missile launch sites known as H-2 and H-3 in western Iraq, bases for the Scud missiles targeted on Israel, had been destroyed. But

Please see MILITARY, A22

Israelis Awaken to Harsh Impact of Iraqi Missiles

By CAREY GOLDBERG
TIMES STAFF WRITER

TEL AVIV—There had been a false sense of security throughout much of Israel on Thursday, prompted by initial reports that U.S. warplanes had knocked out the Iraqi missile launchers that threatened Israel.

And then, early this morning, Saddam Hussein's missiles came.

Residents of this city's impoverished Ezra neighborhood awoke to the brutal impact of an Iraqi Scud missile within yards of their homes. It was but one of several to strike their country.

Those who ventured outside found an immense pit—60 feet across and 20 feet deep—surrounded by about 100 yards of rubble.

Houses nearby were stripped to their frames, littered with the debris of mangled furnishings. Cars were crushed. Shards of glass and splintered shutters littered the streets.

Some of the residents were injured; all of them were stunned. But amazingly, despite the force of the explosion, none of them died.

Please see SCENE, A9

Dow Up 114, C 33% on Early Signs War

■ **Markets:** But Iraqi attack c estors worldwide. Japanese stocks fal er.

By JONATHAN PETERSON
TIMES STAFF WRITER

The Dow Jones industrial average leaped 114.60 points Thursday and the price of oil tumbled by more than $10 a barrel in New York—its biggest one-day drop ever—as financial markets throughout the world responded with glee and, later, fear to news from the Middle East.

For most of the day, investors in the skittish financial markets were electrified by reports of successful allied bombing raids on Iraq. They bid up prices of stocks and bonds, apparently assuming that Saudi oil facilities would not suffer major damage and that stability would

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MORE WAR COVERAGE

CHALLENGE IN THE SKIES
The U.S. and allied air attack on Iraq choreographed 24 kinds of aircraft and relied on a complex system of air traffic control and combat management. **A7**

TURKEY OPENS FRONT
Officials in Turkey authorized U.S. warplanes to take off from the country's Incirlik air base if needed to open a second air front against Iraq. **A11**

BUSH STANDS FIRM
President Bush said "we are not going to stop" attacks until Saddam Hussein pulls his troops out of Kuwait. He avoided calling for the Iraqi's surrender. **A11**

WEATHER: Sunny and warm today and Saturday with clear skies tonight. Civic Center low/high today: 50/78. Details: B5

■ TOP OF THE NEWS ON A2

OUTLOOK IN 'THE NEW ORDER'
The assault on Iraq suggests military conflict will be as much a part of what President Bush calls the "new world order" as it was in the past, experts say. **A11**

ALLIANCES ENDORSE ACTION
The U.S. military operation received strong backing from key economic and defense alliances. Meanwhile, war protests took place in some countries. **A12**

AIRPORT SECURITY TIGHT
Federal officials tightened security at U.S. airports. New rules suspended curbside baggage check-in and ordered unattended bags impounded. **A16**

PROTESTS AT UCLA, USC
The second day of the gulf war ignited student protests at UCLA, USC and campuses nationwide. Street protests widened across the country. **A17**

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■ **Politics:** His speech, att anti-Western attitude like

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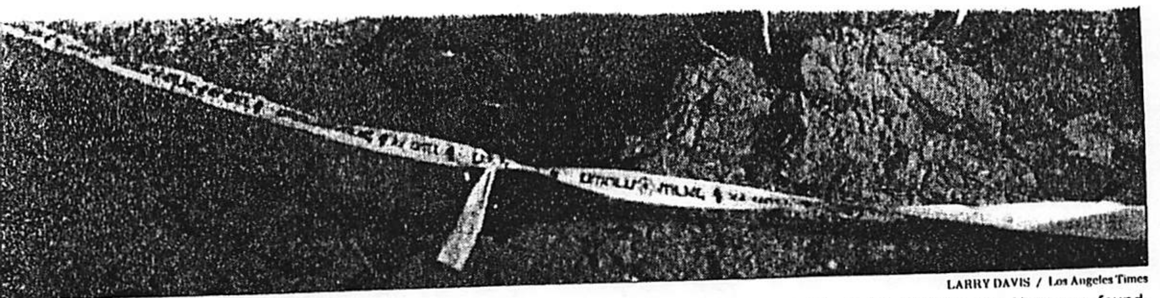

LARRY DAVIS / Los Angeles Times

Workers in protective suits check for chemical-warhead contamination in crater from Iraqi missile that landed in Tel Aviv area. None was found.

SCENE: Israelis Awaken to Giant Missile Crater

Continued from A1

"My whole house fell on me," Tamar Shteiner said, her voice trembling. "There was no alarm. I just woke up and found myself flying."

She said her newborn baby was sheltered from the blast by its crib.

Amnon Sumbul, whose house had all its windows blown out, noted that this particular missile of Hussein had landed on one of Tel Aviv's poorest neighborhoods.

"We're abandoned by everyone anyway," he said. "Now they're shelling us, too."

With the people of Israel on emergency alert and ordered to remain at home, the streets of Tel Aviv were deserted at dawn today. Only the residents of the bombed neighborhood strayed outside to survey the damage in stunned disbelief. Because of fears that Hussein might have tipped his missile with chemical warheads, some wore gas masks.

Although most Israelis had appeared confident earlier that their nation was safe from Hussein's threats of a missile bombardment in retaliation for the American-led attack on Iraq, Morris Rogev, a retired Israeli forensic specialist, said his family was not so sanguine.

"We knew it would happen," Rogev said through a gas mask in a telephone interview with The Times from his apartment in northern Tel Aviv. "We tend to believe what people say. If he says he's going to throw bombs at you, we believe it. . . .

"I'm mad as hell," said Rogev, 60. "But what can I do about it?"

Rogev, who once served as a British army officer in East Africa, said he was awakened by sirens shortly after 2 a.m. Tel Aviv time.

"I said, "That bastard's done it.'

"I think it [one of the missiles] fell not very far from us," he said. "We heard booms. Rain was falling."

Rogev said he and his wife, Gavrialla, and a son stayed in a sealed bedroom. He was dismayed to have forgotten a television set but was monitoring a radio.

The family dog was with them. "She doesn't have a gas mask," Rogev said. "We sedated her, and she is sleeping quietly on the bed."

As the hours passed and dawn approached, Sara Kor, 60, who lives in an apartment near the center of the city, realized the attack was over, for now.

Asked in a telephone interview if she had been frightened, she said she wasn't, but "most people were . . . .

"After all," she said, "it's not the biggest pleasure to know that something [like that] could happen."

As with the attack on Baghdad the night before, it was largely left to television and radio correspondents to paint for America the first spare images of a foreign city as it came under attack.

"I was reading an article on how war might go," Cable News Network correspondent Richard Roth reported from Tel Aviv. "Calm waves lapping on beach. I hear a siren and think it's a false alarm."

Seconds later, he said, blasts shook the city. Suddenly, the nature of the new war seemed drastically changed.

"There were three large explosions, clearly audible in the northern section of Tel Aviv, where I am now," Peter Allen Frost, an ABC radio correspondent, reported to ABC-TV anchor Peter Jennings from one of the network newsrooms in Israel.

The initial shocks were followed by "another few explosions or echoes," Frost continued. "We have reports of three explosions in the southern Tel Aviv region, one of them very close to the ABC news bureau there."

Subsequent announcements indicated that contrary to initial reports, there were no chemical warheads on the missiles.

But concerns that Hussein might employ such weapons had prompted Israeli officials to distribute gas masks and order residents to retreat to sealed rooms in the event of a possible gas attack.

In accordance with such instructions, the news people donned gas masks, straining to make their voices heard through the canister filters on their mouthpieces. All entrances and windows in the newsrooms were sealed, effectively blotting out the sounds of the exploding warheads.

Zubin Mehta, a former director of the Los Angeles Philharmonic who now serves as music director of the Israel Philharmonic, joined others donning the protective gear in the bomb shelter of the Tel Aviv Hilton.

"There have been exercises putting on and off the masks," he told a CNN reporter. "The entire country is bent on discipline."

It was all part of a concerted effort to keep casualties at a minimum.

Times staff writers Edward J. Boyer, John Hurst, Eric Malnic, Carol McGraw, Richard E. Meyer, Patt Morrison and Ronald L. Soble in Los Angeles contributed to this story.

reciting familiar prayers for a quick end to war in voices tinged with worry and anger.

American Jewish leaders fretted about the outcome of Thursday's attack. Rabbis sharpened sermons for Friday night services. And the telephone became almost a hallowed instrument, linking families, carrying prayers and prodding some passive television viewers to gentle action.

In Hancock Park, Marcia Abrams answered the telephone, nodded her assent and hurried to her family room. There, she lit three candles, an act urged on her as part of a burgeoning telephone chain of Orthodox Jews that in a single night married age-old devotion to phone-link technology.

As they spread the word from Jewish seminaries in New York to friends and relatives on the West Coast, each caller urged those who answered to light candles in solidarity with their religious homeland.

"They say we should light candles, recite psalms and pass on the word to three more people," Abrams said. "I called my neighbor and another friend, but they already got their own calls."

Religious leaders throughout the country called on congregants to pray for a speedy peace.

In Washington, Malcolm I. Hoenlein, executive director of the Conference of Presidents of Major American Jewish Organizations, said the members of his 46 groups were "outraged. . . . I'm worried about the dangers to American troops, and now I'm worried about the citizens of Israel."

In Los Angeles, Rabbi Paul Dubin, executive director of the Southern California Board of Rabbis, lamented the military strikes as "familiar territory. . . . We live in a bad neighborhood. And when you live in a neighborhood like that you suffer, obviously."

Israeli-born Americans were quickest to react to the first rumors of war. In Los Angeles, where the Israeli population is estimated at 75,000 to 150,000, many rushed to the first telephones they could find, quickly overloading international circuits.

At the Downtown Sales electronics warehouse on Alameda Street, co-owner Meir Zinar, 50, used an office telephone, repeatedly trying to get through to his family in Tel Aviv. The line was busy.

As he tapped the buttons again and again, other Israeli-born workers crowded around a television. There was no shortage of sets in the warehouse. Several workers ripped open a box, hauled out a brand-new factory model and plugged it in.

As he watched and dialed, Zinar was frightened for his family, but unflinching in his assessment of the retaliation he was sure would

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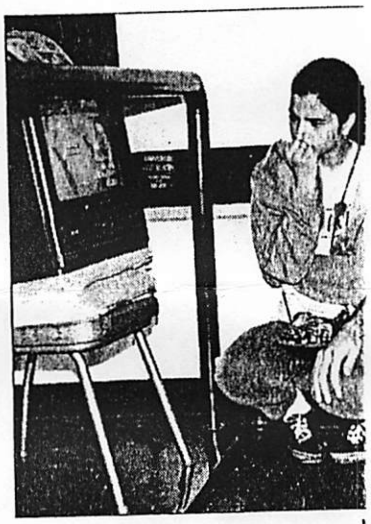


Anat Efraim of Jerusalem and Mike Jaffee
reports of Iraqi attack on Israel at store in F.

CRUISE: Missile Ushers in New Era in U.S. Weaponry

Continued from A1

Lockheed's F-117A Stealth fighter figured prominently in the air raids. Stealth has become a cornerstone of American high-technology weaponry.

"Some have said, 'We spent $3 trillion on our defenses and what did it get us?' " remarked Norman Friedman, author of the Naval Institute's Guide to World Weapons Systems. "Well, just watch! And the important thing is that unlike the last generation of U.S. weapons, these work."

Indeed, Rep. Dave McCurdy (D-Okla.), a member of the House Armed Services and Intelligence committees, said the war against Iraq will be a "laboratory" for a number of virtually untested high-tech weapons. These include the Stealth fighter, forward-looking infrared (FLIR) sensor systems, laser-guided targeting systems and radar-jamming equipment.

■ MAKERS WEIGH RESULTS

Cruise builders in San Diego took somber satisfaction in the missile's apparent success. D1

If this new generation of weapons proves to be as effective as the Tomahawk, experts predicted, the war with Iraq would be a boon for the defense industry.

"This is just an unbelievable validation of what the defense industry has been doing," said PaineWebber aerospace analyst Jack Modzelewski. "How are critics now going to beat up on the defense industry? People will say, 'Lighten up.' The real beneficiaries are going to be the big companies like General Dynamics, McDonnell Douglas and Lockheed."

But just one day of fighting will not erase the costly failures that have affected big defense programs. In the past year, the Pentagon has canceled the Navy A-12 attack jet after spending $3.1 billion and the Lockheed P-7A patrol aircraft after spending $300 million. Further, the $28-billion fleet of B-1 bombers remains grounded while the war is being fought.

And later reports could cast a cloud over preliminary stories of success. When the F-117A was used in the Panama invasion in December, 1989, it was praised immediately afterward as having pinpoint bombing accuracy. But months later, the Air Force admitted that one of the two jets missed its target by a wide mark as a result of human error.

Yet of all the new weapons on trial in Iraq, it was the Tomahawk that was singled out for high praise Thursday by Gen. Colin L. Powell, chairman of the Joint Chiefs of Staff.

"I'm extremely pleased with the effectiveness of the cruise missiles," Powell said. "They were used against a variety of targets where their precision was required for the target, or [where] because of the air defense system around those targets, we felt that an unmanned weapon was the best system to use."

Powell's views were shared by key members of Congress who supported development of the Tomahawk, beginning in 1972, despite the formidable price tag of $1 million each. "The fact that they are as accurate as they are is a technological wonder in itself," McCurdy aid.

This was welcome news to Ralph Hawes, executive vice president for missiles and electronics at General Dynamics, which produces the Tomahawk along with McDonnell Douglas. In the final analysis, he predicted, the missiles will prove to be more than 80% accurate.

The Tomahawk is a 20-foot-long, computer-guided missile that—traveling at low altitudes at about 550 m.p.h.—can search out its intended targets while eluding radar detection. Its computer guidance system is so precise that Yale J. Lubkin, president of a defense contracting firm in Owings Mills, Md., said the Tomahawk operates much like "an airplane without a pilot."

The missile uses both inertial and terrain guidance systems. The inertial system depends on small gyroscopes to find the precise geographical coordinates of the target; the terrain system matches the real landscape with the terrain programmed into its computer memory. Proponents say the missile is so accurate that it can be aimed not just at a building, but at a specific window.

Although Tomahawks can carry nuclear warheads, they were used to drop 1,000-pound conventional bombs on Baghdad. In tests on San Clemente Island, Tomahawks fitted with these warheads have destroyed entire warehouses made of reinforced concrete.

The Tomahawks fired at Baghdad came from several warships, including the battleships Missouri and Wisconsin about 600 miles away in the Persian Gulf. Navy officials said the missiles were programmed to hit air defenses in the Iraqi capital just moments before U.S. pilots arrived on the scene.

Please see CRUISE, A15

TOMAHAWK II

The Tomahawk II cruise missile played a key role at the start of Operation Desert Storm. In the opening hours of the air campaign, more than 100 Tomahawks were fired at sensitive Iraqi targets. Pentagon officials were especially pleased with the performance of the sea-launched radar-guided Tomahawk, which had never been used in combat.

The Tomahawk, capable of following any geographical terrain to its intended target, can "see" through a tiny television camera mounted in its nose.

Length: 21 ft.
Diameter: 20.9 inches
Wing Span: 8 ft. 6 inches
Cruise Engine: 606 pounds thrust turbofan
Range: about 710 miles
Cruising Speed: 550 mph

Source: Jane's Weapon Systems

Los Angeles Times

CRUISE

Continued from A9

U.S. military officials declined to specify exactly what sites in Baghdad were hit by the Tomahawks. But it is well known that these missiles are intended to go after fixed targets such as missile sites, radar facilities and command centers. As an added benefit, they cause enemy radar systems to "light up"—as military officials describe it—making the radar sites easier to detect.

Like most nations, Iraq lacks an effective defense against the Tomahawk, according to Jeff Shaffer, military analyst with the Center for Strategic and International Studies. He said the missile would be vulnerable if Iraqi jets had a "look-down, shoot-down" radar capability.

Although the Tomahawk was available in the mid-1980s, it had never been used. Some experts said the Pentagon did not use the Tomahawk against Libya in 1986 because it was feared that the missile might misfire and fall into Soviet hands, thus compromising the new technology. The development of the missile was marred by a number of flubbed test firings.

And even though the idea of attacking enemy targets without using manned aircraft has been politically popular on Capitol Hill, it has encountered some resistance among U.S. military pilots. They see it as their job to hit tough targets, according to defense analysts.

Many of today's electronic systems were just being developed at the end of the Vietnam War, according to Friedman, and they did not work very well at that time. Since then, he said, the technology available to the defense industry has improved even more than the home computers available to every citizen. "They now work," he said.

The Lockheed F-117 Stealth fighter, for example, played a critical role in destroying Iraqi air defense systems and command centers. Used only briefly during the U.S. invasion of Panama, the Stealth fighter is designed to evade enemy radar.

Even though its designated targets put the Stealth aircraft at high risk, none of them were lost. "We didn't expect to lose any," said Rich, the recently retired Lockheed executive. "The leverage of Stealth is survivability. That's the whole idea. It gives you the element of surprise."

Likewise, some U.S. aircraft are believed to have relied upon FLIR sensor systems to seek their targets through the dark of night. Loral Aeronutronic in Newport Beach manufactures a FLIR pod for the F/A-18 Hornet that is mounted on the plane's fuselage and detects objects by the different levels of heat they emit.

Loral also makes a laser-guided targeting system, known as Pave Tack, for the Air Force's F-111F aircraft. The system was previously used in the attack on Libya to guide bombs to a target by illuminating it with a laser beam. But officials said it did not get a true test until Thursday's air strikes.

Texas Instruments and Martin Marietta make a low-altitude terrain-following radar (LANTIRN) system that gives the F-15 and the F-16 fighter aircraft the ability to navigate at low altitudes at night. Texas Instruments also has made more than 6,000 high-speed, anti-radar HARM missiles, which sense the radar emissions of enemy anti-aircraft positions.

Some analysts attributed the initial lack of Iraqi response to widespread disruption of their communications systems by Lockheed's Compass Call, a C-130 transport plane equipped with special communications countermeasures sys-

Iraqi radar and antiaircraft weapons were apparently immobilized by special electronic warfare aircraft, including the Grumman EA-6B Prowler, the F-4G Wild Weasel and the General Dynamics EF-111. Anti-radar systems detect signals using a very sensitive receiver and use a computer to analyze them. The source of the signal is then destroyed or jammed with a high-power radio signal.

Most defense industry officials were pleased with the performance of the military's high-tech weapons.

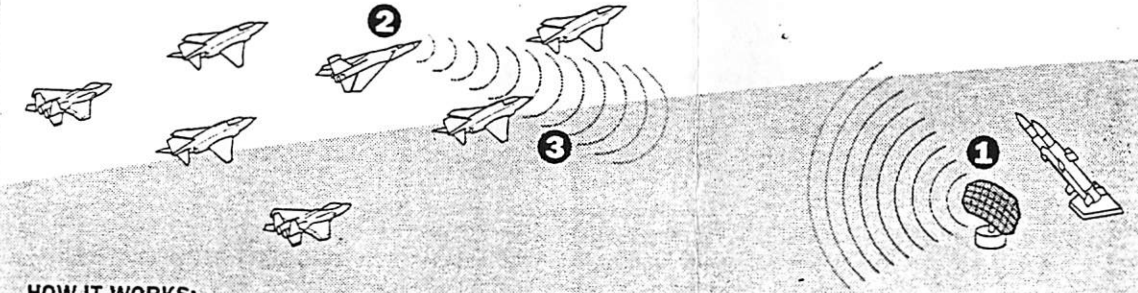
"We may see the ratification of the high-tech approach to military weaponry from this," said John Stuart, chief financial officer of Irvine Sensors, a small Orange County research company building electronic systems for the weaponry. "These systems had never been tested in the field before. And if they are as effective as the first reports indicate, it may have an effect on Congress' approach to spending."

Sara Fritz reported from Washington and Ralph Vartabedian from Los Angeles. Times staff writers Carla Lazzareschi in Los Angeles, Dean Takahashi in Orange County, Chris Kraul in San Diego and Jonathan Weber in San Francisco contributed to this report.

DUELING SIGNALS IN THE SKY:

Radar, invented in the late 1930s, is an acronym for Radio Detection and Ranging. It's a means of using radio signals to determine the location of objects in the sky. In large part, electronic warfare is a battle of radar signals. In modern warfare, several kinds of radar are used:

- **Surveillance radar:** Monitors a certain area of the sky for any objects.
- **Tracking radar:** Follows a particular object by redirecting its beam when the return signal begins to weaken.
- **Lock-on radar:** Found in the missile itself, it homes in on a target and follows it.



HOW IT WORKS:

① A radar system sends out high-frequency radio signals. When those signals strike something in the sky, such as an airplane, they bounce back to the source. The distance of the object is determined by the time it takes for the signal to make the roundtrip.

② Electronic countermeasures aircraft, or special modules mounted on fighter planes, tell the pilot the plane is being "watched" by enemy radar. The warning receiver then "reads" the radar signal to determine its frequency and power. It feeds that information into a computer, which checks the data against its "threat table" to determine what kind of system it needs to counter.

③ Then, counter measures are taken. The radar may be:

- Jammed by broadcasting a very high-powered radio signal at the same frequency.
- Destroyed with a missile or bomb that homes in on that signal.
- Duped by broadcasting a signal that the enemy radar will mistakenly believe is its return signal or a squadron of planes.

SANDY KAY/Los Angeles Times

WEEKEND HOURS: FRIDAY 10 TO 9, SATURDAY 10 TO 7, SUNDAY 11 TO 7*

WINTER HOME SALE

Bush Acts After Iraq Scorns D

COLUMN ONE

Ordnance: High Tech's Gory Side

■ The new generation of weapons and ammunition, developed since the Vietnam War, can destroy tanks, penetrate bunkers and kill or maim troops with deadly precision.

By RALPH VARTABEDIAN
TIMES STAFF WRITER

They sound like a cast of cartoon characters: Adam, Beehive and Bouncing Betty. Yet they are among the most lethal ordnance ever deployed in battle.

Adam, a member of the Army's "family of scatterable mines," is packed with electronic detectors and a charge just large enough to puncture a liver. Beehive spews out 8,800 tiny flechettes—razor sharp darts that cause deep wounds. Bouncing Betty and its sister ordnance systems are designed to detonate at groin level, close to vital organs.

The Gulf War has raised public awareness of many high technology American weapons, such as Stealth fighters and Patriot missiles. But with much less fanfare, the Pentagon since the Vietnam War has developed a new generation of ordnance to destroy tanks, penetrate bunkers and kill troops with deadly effectiveness.

The mechanics of death and destruction are a grim affair. The military's scientific approach and its philosophies—for example, its preference for wounding vital organs over blowing off limbs—can be deeply disquieting to anybody who imagines such matters are left to chance. Many people would rather not know about the gruesome details.

"When my wife meets new friends and they ask, 'What does your husband do?' she tells them, 'He is a business executive at an ordnance manufacturer,' and they act horrified," one official lamented recently. "And they give her a very bad time. People don't like to think about ordnance."

3 People in the business of thinking up such weapons, fine-tuning them and producing them for maximum injury on the battlefield, are deeply committed to what they do. In war, the enemy must be destroyed. In the end, that will save American lives, they say.

In the Persian Gulf War, Saddam Hussein's notorious arsenal of ground weapons may be no match

Please see ORDNANCE, A10

Associated Press

An Iraqi soldier holds up his hands as he and other countrymen are taken prisoners of war by American forces in Saudi Arabia.

Thai Military Seizes Power in Bloodless Coup

By CHARLES P. WALLACE
TIMES STAFF WRITER

BANGKOK, Thailand—Thailand's military Saturday ousted the country's civilian government, suspended the constitution and imposed martial law in a coup that could undermine one of Asia's fastest-growing economies.

Prime Minister Chatichai Choonhavan, a former army general who was the nation's first elected prime minister in 12 years, reportedly was taken from a military plane at gunpoint as he was about to leave a Bangkok airfield on a flight to attend the swearing-in of his new deputy defense minister. Other members of Chatichai's Cabinet also were detained.

The coup was carried out without apparent bloodshed and the capital showed little evidence of military activity. Weekend shoppers jammed downtown streets and malls as usual.

Troops in armored cars surrounded the buildings of Radio Thailand and the government-controlled television station. On the rival military station, an officer read a series of communiques from the new government, which is headed by Gen. Sunthorn Kongsompong, the supreme commander of the Thai military. The first

Please see THAILAND, A30

Allies Accuse Iraq of 'Execution Campaign'

■ **Atrocities:** U.S. military says Iraqi soldiers are killing Kuwaiti civilians to destroy evidence of torture.

By DAVID LAMB
and JOHN BRODER
TIMES STAFF WRITERS

RIYADH, Saudi Arabia—Allied commanders accused Iraq on Saturday of conducting "a systematic campaign of execution" in occupied Kuwait, which a variety of reports suggested is suffering an intensifying devastation by the Iraqis.

"This is terrorism at its finest hour," said Marine Brig. Gen. Richard I. Neal, U.S. military spokesman in Riyadh, charging that Iraqi soldiers were killing Kuwaiti civilians previously subjected to torture. "They are executing people on a routine basis, people not connected with the resistance. They may think the game is up and they are trying to destroy the evidence [of torture], and that evidence is the people."

In Washington, Rear Adm. John (Mike) McConnell, director of intelligence for the Joint Chiefs of Staff, said that analysts estimated that 2,000 to 10,000 Kuwaitis had been arrested and in some cases raped, tortured and mutilated.

"The perpetrators of those crimes will have to answer for it," said Lt. Gen. Thomas W. Kelly, director of operations for the Joint Chiefs.

In Los Angeles, Kuwaitis in exile said reports from the resistance in their country had characterized the mood of citizens there as a mixture of dread and hope. The latest round of Iraqi atrocities was viewed by many Kuwaitis as the sad but expected prelude to freedom.

Besides the reports of the human toll of the Iraqi occupation, McCon-

Please see KUWAIT, A9

U.S. Officials Set Date for the Attack Nearly 2 Weeks Ago

By DAVID LAUTER
TIMES STAFF WRITER

WASHINGTON—For the scores of thousands of American and allied troops who launched the ground attack against Iraq early this morning and for their commanders, the last week of frantic diplomatic maneuverings in Moscow, Baghdad and the United Nations were a sideshow that might just as well never have taken place.

For nearly two weeks, the machinery to launch the assault proceeded like a vast train moving down the tracks. Only a massive

Please see TIMING, A24

Allied Assault Mapped to Rout Crippled Foe

By MELISSA HEALY
and JOHN M. BRODER
TIMES STAFF WRITERS

WASHINGTON—The massive U.S.-led ground assault against the Iraqi army that began early today was designed months ago to be a campaign of speed, deception and seamless maneuver with just one goal, senior Pentagon officials said Saturday: to crush a crippled adversary.

It is a plan for surrounding and destroying the heart of the Iraqi military force, not merely to drive it from Kuwaiti soil.

The offensive, which envisions simultaneous air, land and amphibious attacks across the entire front, contains no intermediate objectives or "firebreaks" where action would pause to allow an orderly Iraqi withdrawal.

Instead, military planners said Saturday, the campaign is designed to do to the Iraqi army exactly what Gen. Colin L. Powell, chairman of the Joint Chiefs of Staff, promised it would: Cut it off and kill it.

Multiple attacks will force the Iraqis to defend at numerous points and will mask the main assault, a 150,000-man armored and airborne thrust which Pentagon officials call "the hammer."

And the attack will not stop until the hammer has fallen on the

Please see OFFENSIVE, A26

Who's Minding the Store at Big Department Chains?

■ **Business:** Retailers try new marketing tactics. Debt loads and demanding customers are hurdles in the '90s.

By MARTHA GROVES
TIMES STAFF WRITER

SAN FRANCISCO—If busy executives in Columbus, Ohio, hate to shop or cannot find the time, the Godfry's men's store will take its suits, ties and shirts to them.

Nordstrom employees are told: "If it makes sense, do it," and at least once it made sense to let a customer return a 3½-year-old pair of shoes.

Wal-Mart discount stores give customers who pay by check or credit card $1 if cashiers fail to call them by name and invite them back.

Welcome to the wonderful world of a pleasure, be it at folksy discount stores or service-minded specialty stores.

Unfortunately, a pleasant experience is not what shoppers have when they visit many of the nation's full-line department stores. Instead, customers often complain of indifferent—even inept—service and uninspired merchandise.

These are fretful times for department stores. Several are slogging through the recession hip-deep in debt. On top of last year's Chapter 11 filing by the owners of Bloomingdale's, Burdines and Jordan Marsh, the recent decision by Carter Hawley Hale Stores Inc., the West's only big department

INSIDE TODAY'S TIMES

■ **WAR STORIES, PHOTOS: A6-28; M1, M3, M5**

■ **OBJECTING TO OBJECTORS**

The military has doubts about the sincerity of 1,700 soldiers who have filed for conscientious objector status, pointing to the timing of their applications. **A11**

■ **RALLY FOR SOVIET UNITY**

Tens of thousands of marchers gathered near the Kremlin to show their support for keeping the Soviet Union intact. **A4**

■ **CHINESE REUNIFICATION**

A panel chaired by Taiwan's president proposed that the rival Chinese governments recognize each other as a first step toward reunification. **A5**

WEATHER: Patchy morning clouds near the coast. Civic Center low/high today: 53/75. Details: B2

Associated Press

Gov. Pete Wilson

■ **WILSON ATTACKS UNION**

Gov. Pete Wilson lashed out at the state's largest teachers union for an ad campaign opposing his proposed two-year, $2-billion reduction in school aid **A3**

Apache Copt Havoc in the I

■ **Weapons:** Using night-vi devastation on Iraqi troops

By JOHN BALZAR
TIMES STAFF WRITER

WITH U.S. FORCES ON T NORTHERN SAUDI BORD Through the powerful nigh gun sights, they looked li sheep flushed from infantrymen bewild fied, jarred from their bunkers u

One by one by attacke understa bits b explo dropp then burst o compatrio

side
Brief
rnia A31
.... A33

INTRO - specifics on anti-personal weapons mentator, he said that the greatest miracle in Exodus was not the 10 plagues that God brought on Egypt. It was the Pharoah's decision to chase the escaping Jews into the Red Sea, bringing on his own death because God had clouded his judgment.

Now a special prayer, added since the war began, is said at midday services at the Western Wall and in Israeli synagogues. It asks God for similar help to "destroy the counsel of our enemies."

Israeli media reported that one group of 10 Jewish mystics in the ultra-religious Meah Shearim quarter of Jerusalem actually attempted to revive an old cabalistic cursing ritual known as the *pulsa denura* (lashes of fire) against Saddam Hussein.

The ritual, which uses black candles, has been either discounted or denounced by most who are situation, thus staying calm.

Lyle Wexler, an Ohr Somayach student originally from Minneapolis, said he would surely have been "freaking out" if it were not for his faith.

"How religion comes into play is that you accept that everything is ultimately for the good," he said.

The Lubavitch sect of Hasidic Jews appeared to take the most optimistic view of the crisis, with its leader reportedly predicting early on that there would be few injuries and with rumors spreading among his followers that the Messiah is due to arrive in April.

The predictions stem in part from biblical prophecies that say the Messiah will come after "the ingathering of the exiles"—which some take to mean the current heavy immigration from the Soviet Union—and after another country

Please see **ORTHODOX, A24**

Officials say that, depending on the ferocity of the ground fighting, it could prove to be the biggest such effort since World War II.

Unlike the Vietnam War, when most casualties were taken to military medical facilities on the West Coast, the burden this time is expected to fall largely on the East Coast hospitals.

"In peacetime, these hospitals are treading water," says one naval reserve physician stationed at Bethesda, Md. "But in wartime, they go on the front lines, too."

The war preparations have been extensive.

Leaves have been canceled and some personnel have been placed on 12-hour shifts. Additional supplies have been ordered, wards have been rearranged or expanded, and contingency plans are ready for doubling bed capacity.

"We know what we can do, and

work formed to be activated in times of disaster—to be ready to handle casualties in the event of an overflow, or to take patients who require special care.

The lobby of the naval hospital has been designated a triage area, where patients on litters will wait to be assigned to appropriate hospital stations.

Planning for even the remotest of possibilities, the garage at Walter Reed has been designated a chemical decontamination unit if terrorists hit the Washington area in a chemical attack.

One difficulty is that no one knows how many casualties to expect, or how bad they will be.

"We have well-trained people, good equipment and everything is in place, but you cannot predict the

Zajtchuk said they expect that the most common wounds will include ballistic injuries, which are caused by bullets or grenades; blast injuries, which often carry a force so great that "they throw things, and cause internal injuries," and massive burns.

The military was recently criticized by several civilian trauma experts for its plan to send critically injured soldiers to military facilities first, rather than to civilian trauma centers where, they said, the expertise is better.

Military medical officials insist that the key trauma work will occur in the field—where such efforts are critical in the minutes and hours after an injury—and most of the wounded will arrive here stabilized.

Further, they say, members of

dren's National Medical Center here.

62% Back Ground War to Oust Hussein, Poll Says

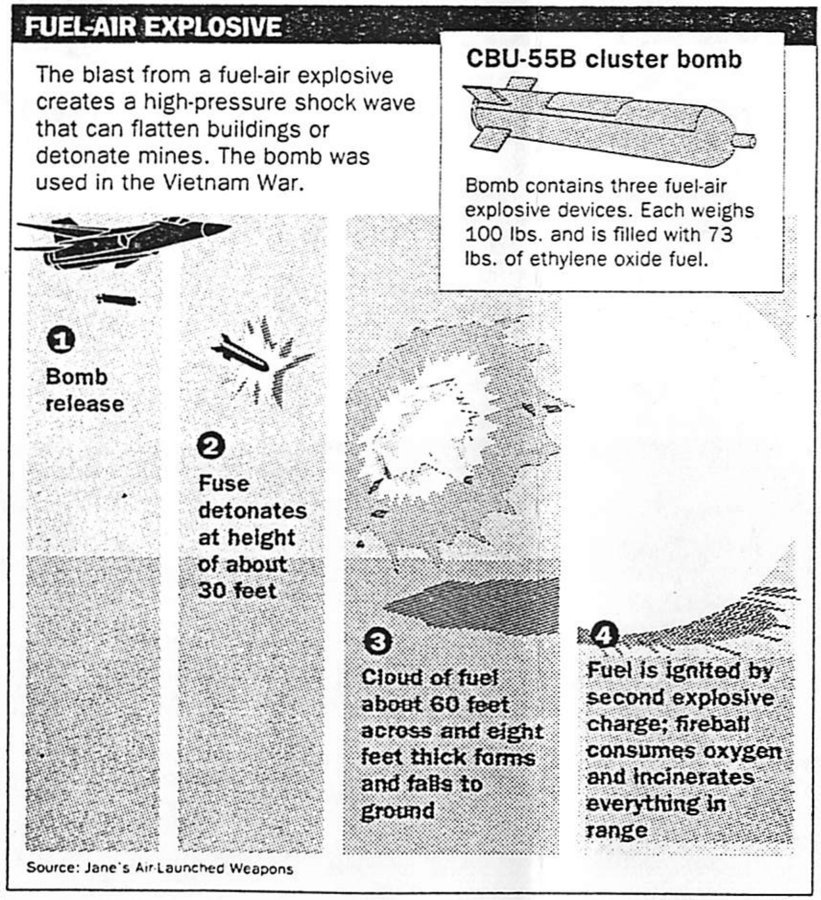
NEW YORK—A poll on the eve of Saturday's deadline for Iraq showed that 62% of Americans supported a ground war to humiliate Saddam Hussein and reduce his ability to cause future trouble, Newsweek reported. The alternative of letting Hussein save face to avoid a bloody ground war appealed to 30%.

The Gallup organization interviewed a national sample of 768 adults by phone Friday for the poll, the magazine said. The margin of sampling error was 4 percentage points either way.

— *Associated Press*

FUEL-AIR EXPLOSIVE

The blast from a fuel-air explosive creates a high-pressure shock wave that can flatten buildings or detonate mines. The bomb was used in the Vietnam War.



CBU-55B cluster bomb

Bomb contains three fuel-air explosive devices. Each weighs 100 lbs. and is filled with 73 lbs. of ethylene oxide fuel.

❶
Bomb release
❷
Fuse detonates at height of about 30 feet
❸
Cloud of fuel about 60 feet across and eight feet thick forms and falls to ground
❹
Fuel is ignited by second explosive charge; fireball consumes oxygen and incinerates everything in range

Source: Jane's Air-Launched Weapons

AP / Los Angeles Times

ORDNANCE: High Technology for Death, Destruction

Continued from A1

for the artillery shells, rockets and mines that the U.S. Army has likely begun to use—weapons so revolutionized in the last two decades that many experts believe they are the most deadly in the world.

"Lethality and accuracy are the two areas that have shown the most improvements," said Jay Sculley, former assistant secretary of the Army.

The same advances in metallurgy, electronics miniaturization and computer modeling that have improved consumer products have also made ordnance more deadly. Fragmentation is more precise. Weapons find their targets with greater accuracy. And the trauma inflicted on human tissue is more calculated.

Only about 20% of the human body consists of vital organs and tissues—such as the brain, major arteries and glands—injury to which will incapacitate a soldier in battle. So a major objective of weapons experts has been to develop ordnance that will increase the probability of a small injury to a vital organ, rather than a major injury to a nonvital part of the body.

It is ordnance that determines winners and losers on the battlefield. An estimated 60% of all deaths in land warfare are caused by artillery; a large proportion of the remainder by mortar fire.

The destructiveness of such weapons is documented in a series of classified handbooks, called J-MEMS or joint munitions effectiveness manuals. The manuals tell commanders at the front line how much carnage they can anticipate when using certain ordnance.

The manual was derived from a series of calculations on ballistic wounds pioneered by the late Marguerite Rogers, a Navy bomb expert, and Joseph Sperrarzza, an Army ballistic wound specialist. Their research resulted in tables and formulas that could determine the probability of a soldier being incapacitated within a given number of seconds, based upon such variables as weapon fragment size and velocity, among others.

That work was followed by a study of 7,801 casualties of the Vietnam War to determine which types of wounds were most debilitating. The Vietnam War analysis by Sperrarzza eventually led the military to supply protective vests to American soldiers—believed to be 25% more effective in reducing wounds than earlier such gear.

Battlefields are clearly getting more lethal. Since fragments are smaller, they travel at far higher velocities for any given explosive charge; with fragments so much smaller, there can be many more of them. That has significantly increased the so-called "probability of kill."

Until the 1970s, cannons had changed little since their introduction during the Sixth Crusade in 1228. A propellent charge hurtles a projectile at high speed out of a tube toward a target. The shell explodes, destroying targets either with shrapnel or with the percussion of the blast.

The problem with a conventional cannon is that it is not terribly accurate, and its fragmentation or blast can kill only over a limited area. The solution has been to improve accuracy with precision guidance and to increase the fragmentation effect by filling the shells with small sub-munitions.

Hence, The Army has deployed the "improved conventional munition" or ICM round. These 155-millimeter artillery shells contain up to 88 bomblets that cover a huge area of a battlefield. They are capable of destroying lightly armored vehicles, such as personnel carriers, with hollow-point, armor-piercing heads and of incapacitating soldiers with secondary fragmentation.

ICM bomblets have an estimated 50% probability of killing a soldier at 15 meters. By spreading 88 sub-munitions, rather than a single large blast, the ICM can kill four times as many soldiers.

Yet in relative terms, the blast from an artillery shell or bomb is not particularly lethal.

The chance of dying from a blast shock does not begin until the pressure reaches 42 pounds per square inch; the probability of

Please see **ORDNANCE, A22**

ORDNANCE: High Tech's Gory Side

Continued from A10

death rises to 90% at 90 pounds per square inch, according to Robert G.S. (Bud) Sewell, a physicist who designed weapons at the China Lake Naval Weapons Center for three decades. By comparison, human eardrums are pierced at a pressure of just a half-pound per square inch.

"Blast is the most inefficient kill mechanism there is for people," Sewell said.

On the other end of the spectrum is the white phosphorus howitzer shell, which bursts high-velocity, burning white phosphorus particles over a limited area. The fragments can continue to burn hours after they have penetrated a soldier's body, creating deep lesions.

Wounds from such incendiary or high-explosive weapons, however, are not always intended to cause death.

"You would rather have casualties [injuries] than death," said Tom Amlie, former technical director of the China Lake center. "Injury raises hell with the enemy's logistics load. With the dead, he doesn't have to do anything. But with a wounded [soldier], he has a huge logistics problem, requiring all kinds of transportation and medical care. And if he doesn't care for his wounded, the morale of his troops will just go to hell."

While many people find such thinking abhorrent, weapons designers argue that the intention is to save the lives of American troops at the expense of the enemy. "A lot of people come unglued," Sewell said. "But it is a job that has to be done. We all deal with it in our own way."

Taking the concept of bomblet-type weapons such as the ICM one step further are so-called bouncing or bounding ordnance systems, designed to detonate at groin level and spray shrapnel at an elevation that is more damaging to vital human organs.

The Adam, dropped out of a howitzer shell, has detectors sensitive to touch, pressure or magnetic fields. Once triggered, a propellent charge launches the mine upward before it detonates. With its advanced electronics, Adam can be remotely detonated or remotely deactivated to avoid posing a hazard to American troops.

But such anti-personnel weapons are only as good as the uniformity of the shrapnel that they disperse.

Metallurgical science has advanced substantially since World War II, when a bomb could produce huge chunks of metal that would have little velocity, or very high speed, dust-size particles capable of inflicting only minor damage to human tissue.

By using sophisticated heat-treating processes and high-carbon steels, however, arms manufacturers have developed shells and submunitions capable of shattering into uniform chunks of lethal metal, much like a tempered automobile windshield shatters into perfect cubes upon impact.

Charles Bernard, an ordnance expert and former assistant deputy undersecretary of defense for land warfare, estimates that just several grains of metal—a cube measuring one-tenth of an inch across each face—are adequate to cause serious injury at velocities of 2,000 to 4,000 feet per second. (There are 7,000 grains in a pound.)

Perhaps the ultimate concept in improved fragmentation is the Beehive system, which has no fragments at all. The Beehive shell is fired out of a cannon and spins at high velocity, spitting out 8,800 flechettes—tiny darts with razor edges capable of causing deep wounds.

The development of these weapons—and the breakthrough finding that tiny, high-velocity fragments were more effective than larger, slow fragments—followed a series of tests during the 1950s and 1960s, in which the Army shot hundreds of goats to study wound tracks.

Much of the research was conducted at the China Lake Naval Weapons Center in California, the Picatinny Army Arsenal in New Jersey and the Aberdeen Proving Grounds in Maryland.

"The reason we used goats was that their internal structure is very similar to the human, and they were cheap—just $10 a head. But don't put my name in the paper, because people get upset," said a scientist involved in the tests. "These goats were very old and ready to die anyway. You know in France, they used pigs and then they fed them to the poor. We didn't do that. We cremated them."

Indeed, testing such lethal weapons has always been a tricky business.

Austin, the China Lake scientist, recalls that in the early days of ordnance testing, he once checked the percussive effects of a bomb by walking 50 feet closer to ground zero in a series of explosions.

"By the time I was knocked off my feet, I said, 'OK, that's all I can stand,'" he recalled. Austin now is deaf in one ear.

Today, the lethality of such weapons is measured in more sophisticated ways, including the use of dummies much like those employed in car-crash tests, according to John Maniatakis, vice president at NI Industries, an ordnance firm. The dummies are arranged in various positions on the ground or in vehicles and then attacked with ordnance.

Anti-personnel weapons are just one area, however, in which conventional ordnance has improved. The Army also has made important strides in ordnance to attack bunkers and defeat tank armor, experts say.

The Iraqi army is said to be well protected in formidable concrete bunkers. But U.S. experts in building and defeating such bunkers are dubious.

"I have never seen a concrete structure that I could not penetrate," said Austin, the China Lake scientist and one of the nation's leading experts on ordnance designed to penetrate concrete and stone.

Austin said the concrete in most Middle Eastern construction projects is poorly mixed and made in sections, not continuously cast, resulting in weak structures by U.S. standards.

Middle Eastern concrete is on a par with U.S. sidewalks, making it easier to penetrate, Austin said. Shells fired by naval guns or bombs dropped by aircraft have hardened steel noses that can push their way through such concrete tens of feet thick, Austin said.

Once the bomb has pushed through, a time-delay fuse detonates, blasting occupants inside the bunker. But even if the bomb fails to make it all the way through, the detonation will cause the interior concrete surface to "spall," spraying occupants with high velocity concrete.

Another relatively new high-technology weapon for destroying structures is the fuel-air explosive, which disperses highly flammable liquid over a large area and then detonates it, creating a huge pressure shock that can knock down buildings and exceed the 90-pound-per-square-inch lethality limit for humans.

The area of greatest strides has been in ordnance that defeats armor. The Army's multiple-launch rocket system can disperse 644 anti-tank mines, each of which fires a "shape-charge" projectile when a tank passes nearby.

A shape charge is an explosive surrounding a cone of metal; on detonation it creates a jet traveling at up to 25,000 feet per second that cuts through armor. Once through the armor, the jet sends a blinding flash of light into the tank, followed by shattered fragments of tank armor flying at high velocity, according to Robert J. Eichelberger, the physicist renowned in ordnance circles for pioneering early shape-charge weapons.

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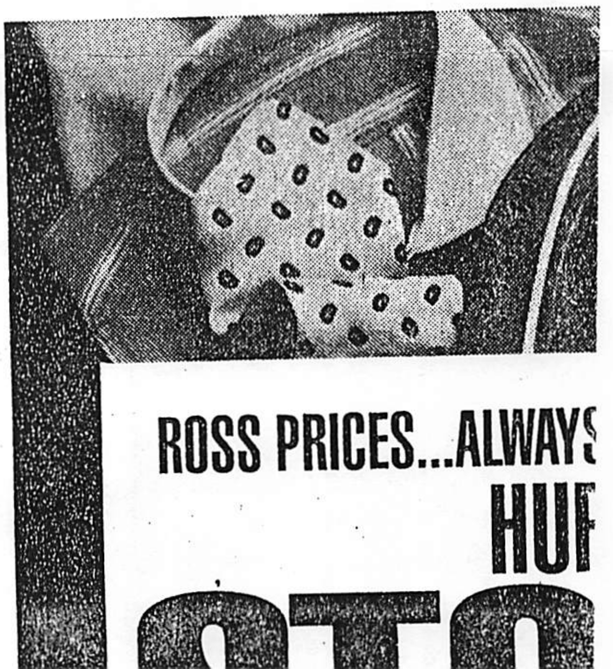

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SUNDAY, FEBRUARY 10, 1991
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COLUMN ONE

What Sort of Man Is Hussein?

■ Ruthless, enigmatic and unpredictable, the Iraqi leader has relentlessly pursued power and a place in history.

By STEPHEN BRAUN
and TRACY WILKINSON
TIMES STAFF WRITERS

Saddam Hussein is everywhere and nowhere, as familiar as a face on a television screen, as elusive as rumor.

Staring impassively, blank as the head on a coin, he speaks to the world one moment from an anonymous house in the Baghdad suburbs and the next, in heated communiques from a front-line bunker. He dons public masks with an actor's flourish, each with its own wardrobe—the statesman's European-tailored business suits, the desert leader's flowing tribal *jellabas*, the commander's drab fatigues and black beret.

Unpredictability is his weapon—
as integral to his survival as his
enchant for secrecy and his reli-
nce on violence as a tool of
veryday business. Throughout his
scent to power—as a young Baath
arty conspirator, as a political
risoner, as a wily bureaucrat in
e presidential palace and, now, as
leader at war—Saddam Hussein
rely has been pinned down.

To Americans, Hussein is both
e personification of evil and an
gma. The rush of events has
cured his motivations; wartime
ndness to his complexities has
plified and demonized his life.

The West thinks he is an aber-
on," said Hani Fukaiki, an Iraqi
ical exile in London and for-
top official of Hussein's na-
alist Arab Baath Socialist Par-
"That is not true. For every
am Hussein who succeeds,
are 1,000 more who want to
his place."

om childhood, swaggering to
l with a gun under his belt, to
esent role as chosen enemy of
Vestern World, the common

Bomb-Weary Baghdad Like 14th Century

By MARK FINEMAN
TIMES STAFF WRITER

AMMAN, Jordan—For the past two weeks in Baghdad, Dr. Rizek Jabr abu Kashef performed major surgery by candlelight.

He amputated legs of children without pain-killers, intravenous tubes or blood transfusions. He watched others die from infections for want of antibiotics or clean water for rehydration and, still others, simply from the cold.

In his little spare time, the Jordanian Red Crescent surgeon sat, freezing in a hospital with too little fuel for heat or consistent generator power; he read by candlelight about how to treat wounds from chemical and nuclear

Please see IRAQ, A20

Lithuania Votes 90% in Favor of Independence

By JOHN-THOR DAHLBURG
TIMES STAFF WRITER

VILNIUS, Soviet Union—Overwhelmingly rejecting President Mikhail S. Gorbachev's authority and his blueprint for a "common Soviet home," more than 2 million Lithuanians streamed to the polls on Saturday to confirm their will to be independent.

"The great majority of people in Lithuania no longer have any fear, and once again they have expressed their determination to the world," Vytautas Landsbergis, the Baltic republic's president, declared.

"They have said . . . what kind of Lithuania they want to create, what kind of Lithuania they will bequeath to their children."

At a late night press conference held inside Lithuania's [illegible]

Gorbachev to Send Envoy to Baghdad

■ **Diplomacy:** The Soviet president, warning that the allies may exceed U.N. mandate, will try to halt 'largest war in decades.'

By ELIZABETH SHOGREN
and NICK B. WILLIAMS Jr.
TIMES STAFF WRITERS

MOSCOW—Soviet President Mikhail S. Gorbachev, warning that allied military actions in the Persian Gulf War threaten to destroy Iraq and thereby "exceed the mandate" set by the United Nations, announced Saturday that he will immediately send an envoy to Baghdad to try to end what he called the "largest war in recent decades."

Gorbachev reiterated his commitment to the U.N. Security Council resolution aimed at liberating Kuwait and expressed concern about the way the U.S.-led coalition in the Persian Gulf War has caused death and damage in Iraq.

"The logic of the military operations, the character of the military actions, threatens to exceed the mandate," Gorbachev said in a statement released by the official news agency Tass. "The number of casualties, including among the civilian population, is growing. Combat operations have already inflicted enormous material damage."

Although British Foreign Secretary Douglas Hurd sought to allay such concern, saying that the allies do not plan to expand their war aims to include the destruction of Iraq or the ouster of Iraqi President Saddam Hussein, both Iran and Pakistan, key nations bordering the Gulf region, tried to increase diplomatic pressure to end the war.

To that end, there were these developments:

- Iranian President Hashemi Rafsanjani met with Sadoun Hammadi, the deputy prime minister of Iraq, who carried a message from President Hussein.
- Immediately after delivering

Grou
Is Ne

Pallbearers carry coffin of M

Town Bur
With Prid

■ **War:** California hamlet
the first combat casualties,

By DEAN E. MURPHY
TIMES STAFF WRITER

IRAQ: Frustration and Anger Mount in Capital

Continued from A1

weapons blasts, in a future the doctor hopes will never come.

Such is life today in besieged Baghdad.

"The whole time, I am thinking we were in the 14th Century," said Abu Kashef, who came from Baghdad to Amman for the weekend and plans to return Tuesday. "There are no telephones, no electricity, no water—even for scrubbing before surgery—and the air raid alarm is continuous, all-day, all-night, every day and every night. Nobody will even listen to it anymore.

"In the first two or three days, they listened. They ran to the shelters. But now, the alarm sounds and they go on shopping in the market. Now, they got used to it."

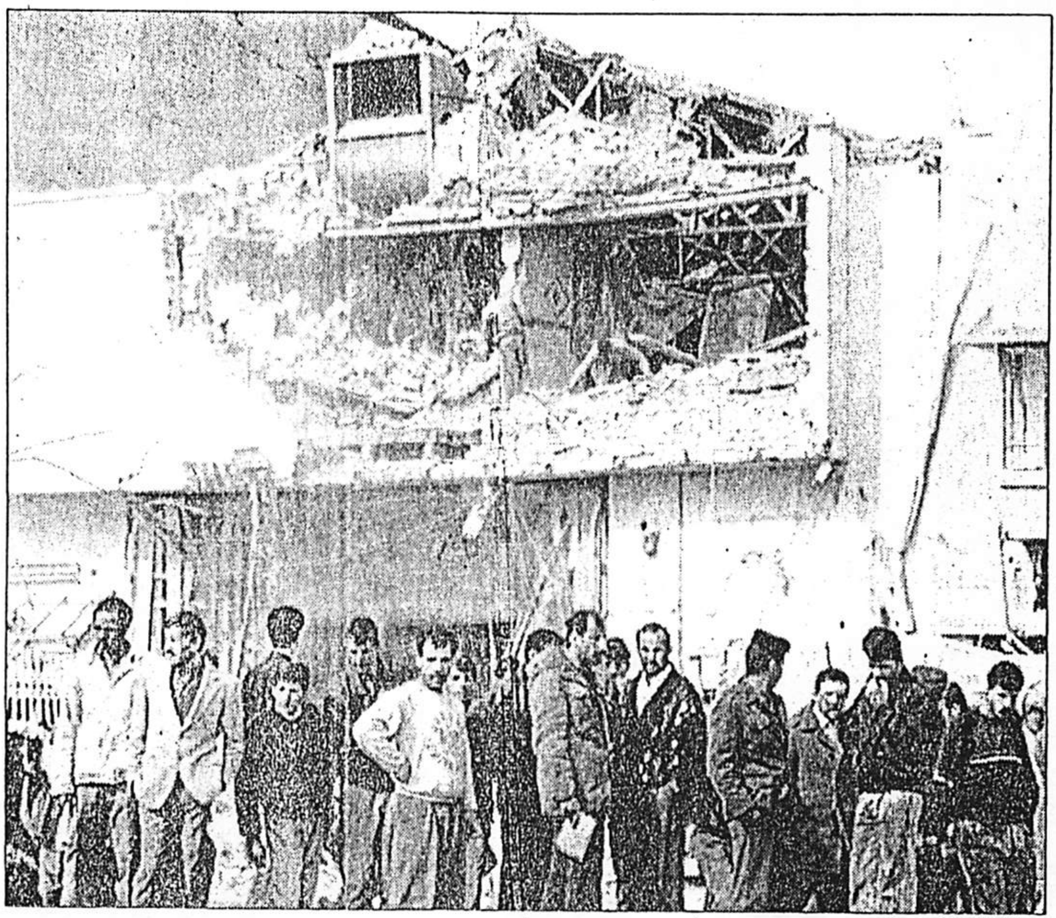
Abu Kashef's inside account of life in war-torn Iraq is just one of more than a dozen reports from foreign doctors, journalists and several Iraqis who have emerged recently. Together they have described the human impact in recent days of the most massive, continuous air assault on a nation since the U.S. carpet bombing of North Vietnam two decades ago.

As the allied war to force Iraq from Kuwait neared the four-week mark, the accounts continued to indicate Saturday that the relentless bombardments have claimed an increasing number of civilian lives throughout Iraq.

The pinpoint bombing runs also have demolished virtually every Iraqi communications center, every power station and most oil refineries, key bridges, military bases and airfields. The result, in effect, has been to push Iraq back a century.

Among the observations to emerge:

- Western journalists returning to Jordan this weekend confirmed reports that key Iraqi government ministries and some military commands have been relocated into schools and other civilian facilities, while elite T-72 tank squadrons have taken cover in palm-treed oases near villages or main roads, increasing the likelihood of more civilian casualties in the future.
- Popular support for Iraqi President Saddam Hussein is just beginning to show signs of fraying, particularly among middle- and upper-class residents of Baghdad, where once-unheard-of graffiti condemning the unchallenged leader has begun to appear, and where even the wife of an Iraqi air force officer told of seeing an angry woman, screaming condemnation of Hussein in the street.
- For most of bomb-weary Baghdad, though, the fear of their first few days and weeks under the bombardment has turned to a deeper frustration and anger. The majority of Iraqis now appear to blame the allies, more than their own president, for a war they believe no longer is aimed simply at driving Iraq from Kuwait but at punishing Iraq for growing too powerful militarily and economically in a region where Israel alone now predominates.
- And clearly, after watching every modern institution around them crushed by bombs, most Iraqis are increasingly convinced of what they dare not speak aloud—that ultimately, Iraq will lose, not just Kuwait but much of Iraq's recent strides toward modernization as well.



Associated Press

Baghdadis pause in front of a building in the Iraqi capital that was struck by allied bombs or missiles.

One of the most poignant interviews with an Iraqi, filmed by several Western television networks visiting Iraq for the past week and smuggled out to Jordan, took place in Baghdad's Adhemeya district on Thursday, the morning after several rockets destroyed a group of civilian houses.

Hassan Bayaji, an articulate Iraqi in his mid-40s whose sister's home had just been destroyed, explained in perfect English that he did not believe that the pilots who fired the rockets had deliberately targeted the houses. Rather, he reckoned, the aircraft were aiming for

Please see IRAQ, A24

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.RAQ: Surgery Risky 'or Baghdad's Victims

ontinued from A20

e nearby Adhemeya bridge, a y logistics span over Baghdad's gris River.

After the missile attack the pre- ous night, Bayaji said he had lped sift through the rubble for man casualties. "They were attered into pieces," he said. 'hey were not whole corpses."

He was asked whether the mbing runs have left Baghdad's arly 4 million people frightened: 'ou may say yes—but angrier, ther angry than frightened," he plied. "When you are in the oblem—in the crisis—you are ghtened. But when it's over, you e very angry."

Bayaji was then asked about the legendary steadfastness that e Iraqis developed and promoted a national trait during their ght-year war with Iran, and nether this war is different from e last one.

"It is very different," he said. Ve had the mastery of the air at e time, and once in two or three onths, an Iranian airplane came. nd they used to hit military stallations—not civilians. Then, ey [the Iranians] started hitting with rockets. But only every 10 ys, every 20 days, a rocket hit a rt of Baghdad. So people got used it.

"Now, it is something different. ey don't give you a chance to eathe. . . . And . . . we hear at 10 people were killed in that arter, or 14 over there. They are t soldiers. They have nothing to with the fighting. They are just e inhabitants of Baghdad."

The iron grip of Iraq's ast intelligence network remains largely intact, nd most Iraqis have long been conditioned never to speak their real thoughts in public.

The Iraqis' conclusion: "Now the get is the Iraqi progress, the qi government, the Iraqi re- ne," he said. "They are trying to t rid of our leader and our gime, and they want to pulverize q and put an end to our econom- growth. . . . It isn't the libera- n of Kuwait. It's punishing Ira- ."

n other settings in Baghdad and half a dozen towns outside the pital, the visiting Western jour- lists and Jordanian doctors, ose trips were unrelated, did counter a handful of rare dis- ys of political dissent.

One of the Western journalists, hard Beeston, of the Times of ndon, quoted one man in his 1-40s who approached him and l, "This isn't our war. This is ldam's war. He has taken the ntry back 40 years."

Such comments were not publi- ed outside Iraq while the jour- ists were in Baghdad. They re routinely removed from news ries and television footage by q's official censors. And al- ugh Beeston, for one, did report m after leaving Iraq on Friday ht, such accounts remain rare.

The iron grip of Iraq's vast elligence network remains gely intact, and most Iraqis have g been conditioned never to ak their real thoughts in public.

With or without censorship, just uttering words of dissent remains dangerous in Baghdad.

But Beeston and the others detected other signs that Hussein's grip is beginning to loosen, if only because of the massive physical damage the allied bombing runs have inflicted on the system he created to enforce it.

Hussein himself has not been seen nor heard by his people in more than 12 days. His key propaganda tool—state-run Iraqi Television—has been unable to broadcast, even locally, in Baghdad since the last of its facilities was demolished a week ago Wednesday.

Even Baghdad Radio, Hussein's last public link to the world outside his secret command bunker, has been so badly damaged that it is often off the air.

Beeston and others found Iraqi draft dodgers who hid out for the first week or two of the war and have since emerged, more confident that Hussein's secret police are now too disorganized and distracted to track them down.

On the badly cratered roads leading to Iraq's strategic, bomb-ravaged city of Basra, recent visitors described seeing dozens of cheap wooden coffins draped in Iraqi flags—soldiers killed in the south and being returned to Baghdad.

In Baghdad every day, as a handful of missiles or bombs continue to miss their military targets, the travelers said that hospitals routinely swell with civilian casualties—haunting images of bloodied, weeping women, hugging babies shredded by shrapnel, others with their own faces pocked or ripped by bomb fragments, still others lying burned in hospital beds.

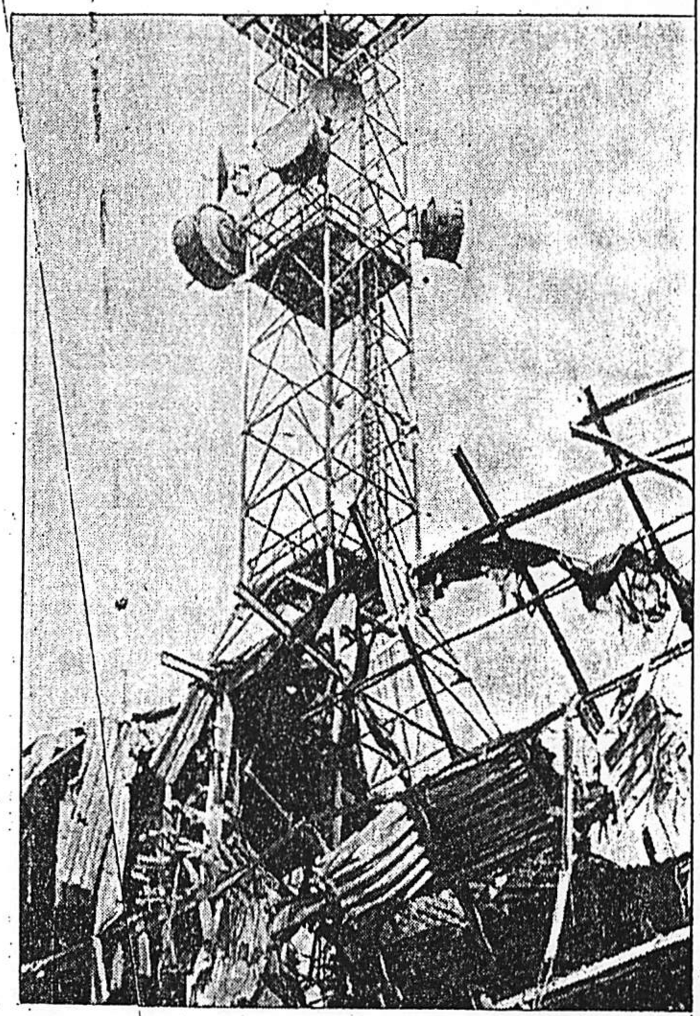
"The biggest problem is we are just not able to provide real medical care," said Abu Kashef of the Jordanian Red Crescent. "Really, you are giving only first-aid treatment."

Abu Kashef, who insisted that he remains apolitical in the war, added that there are not even sufficient X-ray films or blood-typing kits to diagnose patients before surgery.

"If a patient comes with shrapnel, you don't know where it is, so you go and explore in his abdomen," he said. "There is too little blood, so you transfuse blood from one patient to another patient. There are no blood-group kits, so you just take a chance. There's maybe a 10% chance the blood type is wrong, and the patient will die. But if you don't give him blood, the chances are 100%."

Abu Kashef—who has appealed to the United Nations and to humanitarian groups in the nations of the anti-Iraq coalition to sponsor large-scale medical-emergency shipments to Iraq—added that even anesthesia is running low. Operations, such as amputations, are performed with only light anesthesia. And soon, he said, there will be none.

"Really," he added, "the whole thing is a 14th-Century war."



Associated Press

Telecommunications building and tower in downtown Baghdad is severely damaged by allied bombing. Picture was taken Thursday.

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be deeply disquieting who imagines such matters are left to chance. Many people would rather not know about the gruesome details.

"When my wife meets new friends and they ask, 'What does your husband do?' she tells them, 'He is a business executive at an ordnance manufacturer,' and they act horrified," one official lamented recently. "And they give her a very bad time. People don't like to think about ordnance."

People in the business of thinking up such weapons, fine-tuning them and producing them for maximum injury on the battlefield, are deeply committed to what they do. In war, the enemy must be destroyed. In the end, that will save American lives, they say.

In the Persian Gulf War, Saddam Hussein's notorious arsenal of ground weapons may be no match

Please see **ORDNANCE, A10**

minister in 12 years, reportedly was taken from a military plane at gunpoint as he was about to leave a Bangkok airfield on a flight to attend the swearing-in of his new deputy defense minister. Other members of Chatichai's Cabinet also were detained.

The coup was carried out without apparent bloodshed and the capital showed little evidence of military activity. Weekend shoppers jammed downtown streets and malls as usual.

Troops in armored cars surrounded the buildings of Radio Thailand and the government-controlled television station. On the rival military station, an officer read a series of communiques from the new government, which is headed by Gen. Sunthorn Kongsompong, the supreme commander of the Thai military. The first

Please see **THAILAND, A30**

Richard I. Neal, U.S. military spokesman in Riyadh, charging that Iraqi soldiers were killing Kuwaiti civilians previously subjected to torture. "They are executing people on a routine basis, people not connected with the resistance. They may think the game is up and they are trying to destroy the evidence [of torture], and that evidence is the people."

In Washington, Rear Adm. John (Mike) McConnell, director of intelligence for the Joint Chiefs of Staff, said that analysts estimated that 2,000 to 10,000 Kuwaitis had been arrested and in some cases raped, tortured and mutilated.

"The perpetrators of those crimes will have to answer for it," said Lt. Gen. Thomas W. Kelly, director of operations for the Joint Chiefs.

In Los Angeles, Kuwaitis in exile said reports from the resistance in

U.S. Officials Set Date for the Attack Nearly 2 Weeks Ago

By DAVID LAUTER
TIMES STAFF WRITER

WASHINGTON—For the scores of thousands of American and allied troops who launched the ground attack against Iraq early this morning and for their commanders, the last week of frantic diplomatic maneuverings in Moscow, Baghdad and the United Nations were a sideshow that might just as well never have taken place.

For nearly two weeks, the machinery to launch the assault proceeded like a vast train moving down the tracks. Only a massive

Please see **TIMING, A24**

it from Kuwaiti soil.

The offensive, which envisions simultaneous air, land and amphibious attacks across the entire front, contains no intermediate objectives or "firebreaks" where action would pause to allow an orderly Iraqi withdrawal.

Instead, military planners said Saturday, the campaign is designed to do to the Iraqi army exactly what Gen. Colin L. Powell, chairman of the Joint Chiefs of Staff, promised it would: Cut it off and kill it.

Multiple attacks will force the Iraqis to defend at numerous points and will mask the main assault, a 150,000-man armored and airborne thrust which Pentagon officials call "the hammer."

And the attack will not stop until the hammer has fallen on the

Please see **OFFENSIVE, A26**

you are doing and say a prayer for all the coalition forces, and especially for our men and women in uniform, who at this very moment are risking their lives for their country and all of us.

"May God bless and protect each and every one of them," Bush said, "and may God bless the United States of America."

At the United Nations, Iraq's deputy ambassador, Sabah Talat Kadrat, vowed: "The war will be long."

Defense Secretary Dick Cheney declared a blackout on information about the assault. He told reporters at the Pentagon that all military briefings in Washington and at allied headquarters in Saudi Arabia would be suspended until further notice. Cheney cited the safety of allied troops and the security of

Please see **GULF, A6**

Who's Minding the Store at Big Department Chains?

■ **Business:** Retailers try new marketing tactics. Debt loads and demanding customers are hurdles in the '90s.

By MARTHA GROVES
TIMES STAFF WRITER

SAN FRANCISCO—If busy executives in Columbus, Ohio, hate to shop or cannot find the time, the Godfry's men's store will take its suits, ties and shirts to them.

Nordstrom employees are told: "If it makes sense, do it," and at least once it made sense to let a customer return a 3½-year-old pair of shoes.

Wal-Mart discount stores give customers who pay by check or credit card $1 if cashiers fail to call them by name and invite them back.

Welcome to the wonderful world of special touches and customer-driven retailing, where shopping is a pleasure, be it at folksy discount stores or service-minded specialty stores.

Unfortunately, a pleasant experience is not what shoppers have when they visit many of the nation's full-line department stores. Instead, customers often complain of indifferent—even inept—service and uninspired merchandise.

These are fretful times for department stores. Several are slogging through the recession hip-deep in debt. On top of last year's Chapter 11 filing by the owners of Bloomingdale's, Burdines and Jordan Marsh, the recent decision by Carter Hawley Hale Stores Inc., the West's only big department store company, to seek refuge from

Please see **RETAILING, A32**

INSIDE TODAY'S TIMES

■ **WAR STORIES, PHOTOS: A6-28; M1, M3, M5**

■ **OBJECTING TO OBJECTORS**

The military has doubts about the sincerity of 1,700 soldiers who have filed for conscientious objector status, pointing to the timing of their applications. **A11**

■ **RALLY FOR SOVIET UNITY**

Tens of thousands of marchers gathered near the Kremlin to show their support for keeping the Soviet Union intact. **A4**

■ **CHINESE REUNIFICATION**

A panel chaired by Taiwan's president proposed that the rival Chinese governments recognize each other as a first step toward reunification. **A5**

WEATHER: Patchy morning clouds near the coast. Civic Center low/high today: 53/75. Details: B2

■ TOP OF THE NEWS ON A2

Associated Press

Gov. Pete Wilson

■ **WILSON ATTACKS UNION**

Gov. Pete Wilson lashed out at the state's largest teachers union for an ad campaign opposing his proposed two-year, $2-billion reduction in school aid. **A3**

Apache Copters: Deadly Havoc in the Dark of Night

■ **Weapons:** Using night-vision sights, air cavalry visits devastation on Iraqi troops behind the lines.

By JOHN BALZAR
TIMES STAFF WRITER

WITH U.S. FORCES ON THE NORTHERN SAUDI BORDER—Through the powerful night-vision gun sights, they looked like ghostly sheep flushed from a pen—Iraqi infantrymen bewildered and terrified, jarred from sleep and fleeing their bunkers under a hellish fire.

One by one, they were cut down by attackers they could not see or understand. Some were blown to bits by bursts of 30-millimeter exploding cannon shells. One man dropped, writhed on the ground, then struggled to his feet; another burst of fire tore him apart. A compatriot twice emerged standing when shot at. As if in pity, the U.S. Army attackers turned and let him live.

For the Army's 18th Airborne Corps, the ground war had begun earlier. It was carried straight to the enemy in the blackness of night, at 50 feet above the sand, by the Army's longest punch: the fast, deadly and controversial AH-64 Apache attack helicopter.

Then, upon the Apaches' return to forward attack bases—like here, with the 5th Squadron of the 6th Cavalry, the Knight Raiders—the evidence of this early ground fighting is displayed in startling, sharp, intensely violent videotapes from gun cameras.

The $10-million-plus Apaches are night fighters and tank killers.

Please see **APACHES, A28**

* Intro see next pg

APACHES: Panic, Death in Dark of Night

Continued from A1

Their pilots are guided by an infrared optical system that turns blackness into a bright phosphorescent daylight in which you can all but read the expressions of shock on the faces of the Iraqi soldiers as they are ground up by cannon rounds and an ugly sampler of rockets.

For those who try to stay in bunkers, laser-guided Hellfire missiles are launched to an altitude of a half-mile, from where they are almost straight down onto the target.

In the briefing tent, the officers play the tapes and a hush falls over the room. Even hardened soldiers hold their breath as the Iraqi soldiers, as big as football players on the television screen, run with nowhere to hide.

These are not bridges exploding or airplane hangers. These are men.

"We're out there to kill their tanks and trucks, to harass and demoralize their troops," said Lt. Col. Randy Tieszen, a squadron commander from Rapid City, S.D. "We've been here since August. We've waited a long time for this."

Tieszen rides in the front seat of the Apache, working an arcade of weaponry and directing his squadron attack. Behind him, peering over his helmet, sits the pilot, Chief Warrant Officer 4 Ron Balak, of Beemer, Neb.

The next phase of the Persian Gulf War may be the greatest tank battle in a half-century. But the soldiers who fly the Apaches believe they will kill half the Iraqi tanks from their hovering position, low and off in the distance.

And with readiness reported at high levels for the complicated and often-doubted Apache, their pilots are growing increasingly confident.

Balak—sitting in his flight suit, the zipper shiny from wear, a .38-caliber revolver slung over his shoulder—described his first combat mission in a 20-year flying career: "For almost five months, we've been leaning forward to do this job. . . . You always envision some scenario how combat will be. But I just didn't envision going up there and shooting the hell out of everything in the dark and have them not know what the hell hit them. . . .

"A truck blows up to the right, the ground blows up to the left," he said. "They had no idea where we were or what was hitting them.

"When we got back, I sat there on the wing, and I was laughing," he added. "I wasn't laughing at the Iraqis. I was thinking of the training and the anticipation. . . . I was probably laughing at myself. . . . I laid there in bed and said, 'OK, I'm tired, I've got to get to sleep.' And then I'd think about sneaking up there and blowing this up, blowing that up."

Later, he recalled, "a guy came up to me, and we were slapping each other on the back and all that stuff, and he said, 'By God, I thought we had shot into a damn farm. It looked like somebody opened up the sheep pen.' "

Before the war, the Apache was high on the "troubled" list of U.S. weapons programs. Its reliability was so often challenged that even some pilots said they had their doubts about the craft. But now, with around-the-clock maintenance available and a limited combat role, thus far the Apache is slowly gaining respect.

As designed, the gunship represents not just advanced technology but a complete reversal of Army ground tactics. In Vietnam, the Americans fought during the day and went home or holed up later. The night belonged to the enemy.

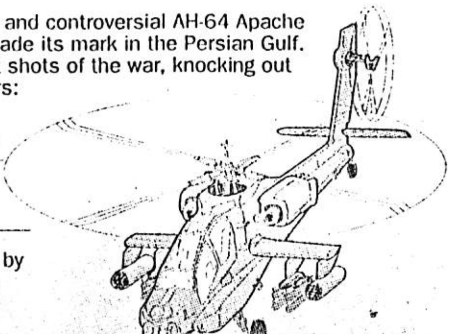
But, beginning in the late 1970s and accelerating into the mid-1980s, Army doctrine emphasized night fighting. Originally, the idea was that a smaller U.S. force with night-fighting capability could hold off a larger Soviet force in the event of a European war. Now, in the Persian Gulf, the U.S. Army believes its advantage is greater because the Iraqis reportedly have little sophisticated means of carrying the battle past sunset.

So the low-slung, wasp-like Apaches wait out the sunlight hours on the ground, spread wide and far across the hardpan desert here along the front. Their crews live nocturnal lives, too. With the moon, the men, most of them young warrant officers—the top of their flight classes, for this is the elite of Army aviation—spring to life, heading north in their machines of death.

This report was reviewed by military censors.

THE APACHE ATTACK HELICOPTER

The Army's fast, deadly and controversial AH-64 Apache attack helicopter has made its mark in the Persian Gulf. It fired some of the first shots of the war, knocking out Iraqi early-warning radars:



COST: $10 million plus

WHAT: Night fighters and tank killers

HOW: Pilots are guided by infrared optical system, which turns blackness into a bright phosphorescent daylight

WEAPONS: 30-mm cannon, laser-guided Hellfire missiles

BACKGROUND: Since going into production in 1982, the Apache has had a history of mechanical and logistical problems. Its reliability was repeatedly questioned. But its role in the Gulf has helped it gain respect.

Los Angeles Times

Gulf Oil Slick May Kill Migrating Birds, Turtles

DHAHRAN, Saudi Arabia—Up to 2 million migrating birds risk a painful death in the world's worst oil slick when they land in the Persian Gulf on their annual journey to Europe, John Walsh, projects director for the World Society for the Protection of Animals, said Saturday.

Thousands of green turtles due in the Gulf soon for spring and summer nesting will be poisoned, Walsh added.

— *Reuters*

Los Angeles Times
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Attacks are repeated

— Plants near Baghdad + Basra

On 26 January, Lt. Col. Mike Scott, the Riyadh briefer said that a "significant amount" of Iraq's ability to produce chemical/biological weapons had been destroyed. But, he said, Iraq's "capacity to store it remains very large. Those storage numbers that they had prior to the campaign have now moved up on the priority list such that we're starting to go after them quite heavily." On 29 January, the Pentagon briefer stated that although the US had "a good idea" of the types of chemical weapons produced at specific sites, "having destroyed or damaged that facility doesn't tell us a great deal about what may be in the battlefield, because a great deal of this chemical and biological capability has been dispersed, and indeed was dispersed long before Operation Desert Storm began."

At the beginning of the third week (on 30 January), Gen. Schwarzkopf revealed that 18 chemical facilities had been targeted. Overall 31 chemical, biological and nuclear locations had been attacked, and that "Over half those facilities have been severely damaged or destroyed. We have absolute confirmation that we've destroyed over 11 chemical and biological storage areas. We've also destroyed or heavily damaged three chemical and biological production facilities, and we're going to continue a relentless attack on this very, very heinous weapon system."

On 5 February, the military briefer in Riyadh reiterated that the fixed chemical facilities were being attacked again and again: "You could have one, for example, that is 55 acres in size. So it requires to selectively go back and continue degrading his abilities, which is why we will restrike certain targets." On Sunday 10 February, Sec. Cheney stated in Riyadh during his weekend visit that production facilities for chemical, biological and nuclear weapons are "for the most part destroyed; we've done good work in destroying most of the storage facilities for his chemical and biological capabilities, although clearly he retains significant chemical weapons."

On 11 February, Brig. Gen. Richard Neal said in Riyadh that chemical storage facilities in and around Basra had been attacked, while Lt. Gen. Thomas Kelly added at the Pentagon briefing that Iraqi chemical production, "ranges from zero to maybe ten percent of what they had before the war." On Friday 15 February, Gen. Neal said in Riyadh that air strikes in the Kuwaiti theater of operations had concentrated on Iraq's ability to deliver battlefield chemical weapons, attacking chemical weapons stores and weapons, and delivery systems, including 130mm and 152mm artillery, and FROG short-range missiles.

3. The Iraqi Chemical Infrastructure:

- Adashat phosphate mining center, in western Iraq near the Syrian border (phosphates serve as a precursor chemical for nerve gas production), which may also have chemical or nerve gas production capabilities.
- Baiji industrial fertilizer complex, some 200 kilometers north of Baghdad, used for producing ammonia, a feedstock for nerve gas production.
- Balad air base, north of Baghdad which has a military

TARGETS

Repeated attacks
284 Tomahawks

Aircraft losses:
US: none Total: 22
Allied: none Total: 10
Iraqi: none Total: 59
Casualties and POWs:
US: none Total: 12 KIA, 24 MIA, 9 POW
Allied: none Total: not reported
Iraqi: none Total: 858 POW reported
Comments: Continues to restrike strategic targets; some 20 fighter strike packages of 20 or more aircraft and six B-52 strikes were directed against the Republican Guards. One unit of KC-135 tankers reported it had flown more than 1000 sorties for more than 4000 refuelings.

4 February
Number of sorties: 2700 Total: 44,000
Tomahawk launches: unk Total: 284
Aircraft losses:
US: 1 UH-1 Total: 22
Allied: none Total: 10
Iraqi: none Total: 59
Casualties and POWs:
US: 4 KIA Total: 12 KIA, 26 MIA, 8 POW
Allied: unk Total: no new reports
Iraqi: unk Total: over 800 POWs
Comments: Some 250 individual aircraft sorties were flown against Republican Guard forces. Targeting directed to neutralize Iraqi efforts to regenerate command and control, airfield, and nuclear, chemical, and biological facilities.

3 February
Number of sorties: 2500 Total: over 41,000
Tomahawk launches: none Total: 284
Aircraft losses:
US: 1 AH-1 Total: 21
1 B-52
Allied: none Total: 10
Iraqi: none Total: 59
Casualties and POWs:
US: 2 KIA, 3 MIA Total: 12 KIA, 26 MIA, 8 POW
Allied: unk Total: 13 MIA
Iraqi: unk Total: 800 POW
Comments: Coalition air forces are flying 16% of all sorties. Of 40 fighter packages flown, 24 targeted the Republican Guards. Reportedly 25 of 35 key bridges have been destroyed.

2 February
Number of sorties: 2600 Total: 37,000
Tomahawk launches: 6 Total: 284
Aircraft losses:
US: 1 A-10 Total: 19
1 A-6E
Allied: none Total: 10
Iraqi: 4 unnamed Total: 59
Casualties and POWs:

~~go next pg?~~ TARGETS

of the war, he repeated word-for-word Webster's formula about the unworkability of sanctions. For all intents and purposes, the impassioned debate of a few days earlier had become purely academic, with one exception: the role of the CIA. "It was politically suborned," says Senator Daniel Patrick Moynihan, who suggests that the agency has outlived its usefulness and ought to be abolished, its functions parceled out to the State Department and the Pentagon. If Moynihan's idea were to become reality, then the relation of foreign policy to intelligence, of aims to methods, would be far clearer—and so would the lines of accountability.

The CIA is a creature of the cold war, created by the National Security Act of 1947, the year of the Truman Doctrine. Its mission was wholly defined by the long twilight struggle, which it was assumed would last until the end of days. The entire nervous system of the agency—a tangle of global operations that in time grew into a bureaucracy magnitudes larger than the State Department's—was sparked by the cold war impulse. No matter where or when, why or how, the ultimate rationale remained constant. Yet for all the millions of secrets collected, the CIA missed the one big fact it was invented to discover: that the Soviet Union was collapsing.

Since the cold war started melting away the CIA has lurched from one calling to another—the war on drugs, anti-terrorism, and, finally, sanctions against Iraq. When the president's policy was sanctions, the CIA provided the grist of supporting data. But when that policy shifted overnight, so did the CIA. Its post-cold-war mission began to look remarkably like its worst moments during the cold war: using intelligence to serve the shifting, short-term political objectives of the president—a president who had been appointed CIA director in the Nixon aftermath to restore the agency's soiled reputation. ●

Iraq under air seige.

BLITZED

By Michael Kelly

AMMAN, JORDAN

The days of delusion are dead in Baghdad. The city has finally discovered the obvious: a contest between a Third World semi-power fighting World War II and a First World superpower fighting World War III is no contest at all. The war could well go on for several bloody months or even longer, and kill many soldiers, but its inevitable conclusion is strongly suggested in one fact easily grasped by the people on the receiving end of the American-led attack. This is a war in which, in the very first hour of conflict, the attacking forces were able to destroy specific targets at will, with no losses, in the heart of the defending forces' capital city. And yet there was Saddam, still spouting the big lie. "The infidel tyrant's missiles and aircraft are being destroyed," he said in his first post-D-day radio address, on January 20. "His defeat will be certain."

But big lies weren't playing too well in Baghdad after January 16. With allied bombs and missiles redrawing the skyline every hour, the entire city was a reality check. The first morning of the war I was standing across the Tigris River from the Ministry of Defense, looking at the black smoke pouring out of it from a cruise missile hit five minutes earlier, when the second missile smacked home, shuddering the ground with the explosion and sending up great new billows of smoke. Five minutes after that, the third missile boomed. In ten minutes the heart and symbol of Iraq's armed forces was a burning rubble. The hospital next to it, though, was untouched, and so were the homes crowded around it. The attack had been so swift that the anti-aircraft guns had not even fired.

By the morning of January 20, four days after a U.S. Air Force Stealth bomber opened the war with a 2,000-pound laser-guided bomb targeted precisely on the microwave dishes atop Baghdad's international telecommunications building, the city was crippled. There was no mainline electricity, no running water, no working telephones. The streets were mostly deserted, the shops mostly closed. The few grocery stores open for business were charging extortionate prices for such basics as candles and beer, and were mobbed with panic buyers. The mood of the people could be gauged by the growing number of accidents, the cars of frightened drivers piling up against lampposts and guard rails with every round of anti-aircraft fire.

The allied bombs and missiles had destroyed or crippled the Defense Ministry, the telecommunications building, the power station, seven telecommunication microwave relay towers, the headquarters of Saddam Hussein's Baath Arab Socialist Party, the huge (and, for Iraq's economy, vital) Dora oil refinery, a key nuclear research facility, the air force headquarters, and the airport. That's just in greater Baghdad. In the first two days of war the allied forces dropped 5 million pounds of bombs on Iraq and Kuwait, fired 196 Tomahawk cruise missiles, ran 2,000 B-52 and Stealth bomber attack missions, and so on and on, to devastating effect.

You couldn't turn around without seeing something get taken out. My drive out of Iraq took about twenty hours longer than it should have, in part because we had to keep pulling over to wait out bombardments. In that one 500-mile drive, we saw allied planes pound the big Al Walid air base in the western Iraqi desert, a major phosphorous plant, and an oil pipeline pumping station. The anti-aircraft fire was, as always, spirited and heavy and just about wholly ineffective.

[illegible] J / TARGETS

TARGETS

Dam bust 'would end Iraq war'

CONSULTING ENGINEERS have told allied forces commanders that destroying Iraq's Mosul dam would result in a massive flood wave engulfing Baghdad and much of southern Iraq.

The tactic would bring Iraq's war effort to a virtual end say engineers. But they have advised against such a move because it would cause massive loss of civilian lives. Instead, other water related targets have been pinpointed, the destruction of which would cause few deaths but make life so uncomfortable that civilians might clamour for an end to the Iraqi occupation of Kuwait.

The consultants, some of whom have intimate knowledge of Iraq, have also advised that bombing raids on water treatment and sewage treatment plants to the north of Baghdad will prove largely ineffective in bringing the Iraqi people to heel by means of diminishing water quality.

Mosul's huge earthfill dam was finished in 1983 and has a crest length of some 3.6km, with a height from foundation in excess of 130m. Since full impounding just over a year ago, it has been renamed Saddam Hussein dam. It has a massive reservoir with 12.5km³ of water poised above Baghdad.

If the allies decided to bomb the structure 'the flood wave could be enormous and if the dam was substantially breached the whole of southern Iraq could be wiped out' claimed one consultant.

Another consultant, who confirmed that his firm had provided maps for the MoD, said 'if the allies were intent on destroying Iraq and its people all they have to do is bomb the Mosul dam, but that would be monstrous'

Iraq's military rulers are well aware of the threat to the vast dam, informed sources said.

During the Iran/Iraq war Saddam realised the possible danger and ordered the building of a flood retention structure at nearby Badush.

Construction of the structure is thought to have halted last week when the allies attacked, according to sources close to the military, leaving Mosul highly vulnerable.

Bombing of key dams, treatment works and infrastructure is thought to be among the allied forces' top military and communications structures have been at least partially destroyed.

The consultants have told Britain's military leaders that Iraq's principal river, the Tigris, would provide 'relatively potable' water even if desalination plant and sewage works near the Samarra barrage and Ad Haim dam, just north of Baghdad, were destroyed and the effluent was allowed to flow freely into the river.

Instead, allied bombing should concentrate on hitting as many pumping stations and distribution plants as possible to cut off Baghdad's water and sewerage system which relies totally on pumping.

The advice is thought to have been taken, so far anyway, although no confirmation of what targets are being attacked is being given by the military.

Several engineers have been helping with identification of targets but have asked not to be named. Scale models of buildings and other structures to help pilots train are said to have resulted from the briefings.

also been involved with the huge £3800M redevelopment of Baghdad city waterworks, built over the past 10 years. Most work was finished in 1987 but an extension, started before the Kuwait invasion, has now ground to a halt. The initial phases supplied new intake works, transmission pipelines, pumping stations, treatment plant and distribution works. They are thought to have been targeted in allied air raids.

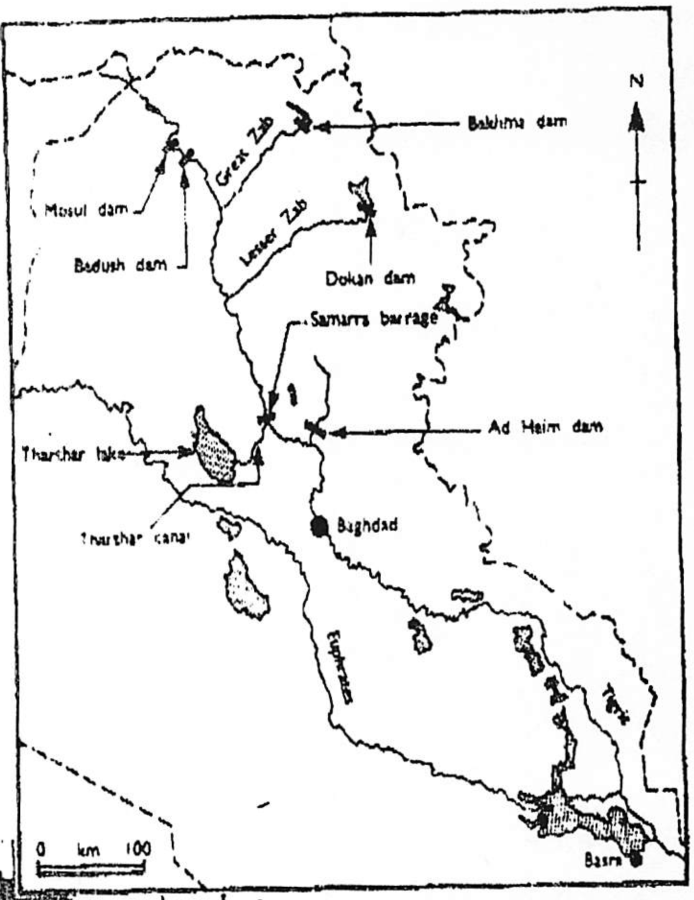
Other structures that may come under fire are flow regulating devices along the river Tigris, especially one at the Tharthar lake, north west of Baghdad.

Water from the Tigris is drained to the lake via the manmade Tharthar channel which acts as a regulating valve, and is then allowed to run off into the Euphrates. The lake acts as a 'saline sink', which has led Iraq's government to install massive desalination plants in an attempt to rid itself of the salt problem.

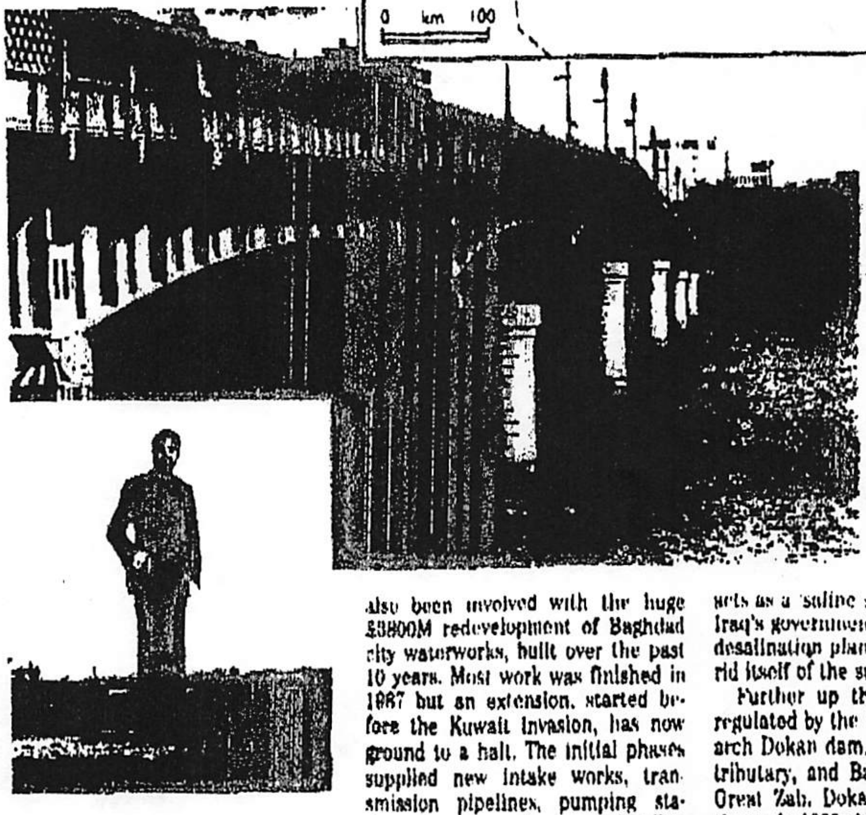
Further up the Tigris flows are regulated by the 120m high concrete arch Dokan dam, on the Lesser Zab tributary, and Bakhma dam on the Great Zab. Dokan was designed in the early 1950s by a British firm.

Bakhma is a massive 180m high earthfill structure under construction. When finished it was planned to have a large 2000MW hydroelectric power station attached. Both dams could be priority military targets said one source, primarily because damage to people around would be limited but bombing such installations would make life 'extremely uncomfortable'.

Delroy Alexander



ABOVE: Major water structures in Iraq.



LEFT: Low lying Baghdad would be swept away if Mosul dam were breached.

TARGETS - Dams, pumping

ock faces fresh revolt by anti-war MPs

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all Iraqi forces from Kuwait and a peace conference 'with the objective of settling all outstanding disputes and achieving international peace and security in the region'.

Scottish MP Maria Fyfe, the first of four MPs to resign from the Labour front bench in protest at the Kinnock line, said many of her colleagues had accepted the war through a desire to back up the United Nations.

'But here is an offer [by Iraq] made to the UN and rejected out of hand by the United States as if they have the right to call the shots. It is time the UN reasserted itself — as a body of all its member states, not just the Security Council — and said: "Do we think this is something worth looking at?"'

Tony Benn, speaking at a meeting in Guildford last night, accused the Government of using the war as a diversion from its domestic problems and of 'slavishly' following America.

'The war movement pretends that it never really wanted to go to war; that it is being fought, solely, on behalf of the UN; that it has been authorised by parliament and has overwhelming public support,' he said.

'The truth is very different and there are some very influential people who do actively want the war to continue, including the military, who are anxious to protect their budgets, and the arms manufacturers determined to protect profits.'

MPs on all sides of the House, including the Liberals who yesterday called for an immediate start to the peace process, will have a further opportunity to make their views known on Thursday when the Scottish National Party initiates a debate on Gulf war aims.

The debate could give rise to further difficulties for Mr Kinnock. With the Conservatives likely to put their own amendment to any SNP motion, Labour peaceniks will have the chance to vote against the war and the Government at the same time, sidestepping previous worries that a vote against war meant a vote against their own leadership.

Sewer bombing spreads disease

TENS of thousands of Baghdad's citizens are suffering from severe diarrhoea, resulting in 'many deaths', because of coalition bombing of water and sewerage plants, according to Mohamed Sayed, Iraq's health minister, writes **Polly Ghazi**.

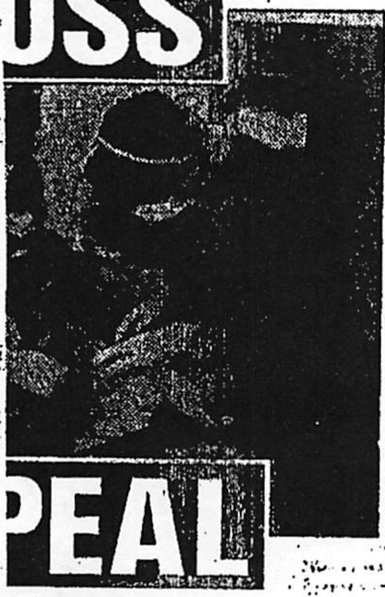
He described water as 'the greatest health problem we have in the country' and accused the Allies of 'systematic bombing of water installations, pumping stations and even reservoirs' in the Iraqi capital.

The Iraqi allegations are revealed in a report by leading water scientist Dr David Wheeler of the Guildford-based Robens Institute, an affiliate of the World Health Organisation.

The report concludes that the Iraqi capital faces a 'very severe risk of epidemic diseases' such as diarrhoea, salmonella or hepatitis, as a result of known bomb damage to Iraq. 'The Iraqi claims of widespread illness are entirely consistent with the results of our analysis,' Dr Wheeler told *The Observer* yesterday.

The allegations also coincide with British reports that coalition forces are deliberately attacking water and sewerage installations in Baghdad, in clear breach of allied war aims.

According to *New Civil Engineer* magazine, several British engineering firms who built Baghdad's water and sewerage systems are now helping the military target key installations, advising them to concentrate bombing on pumping stations and distribution plants.



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The Weather

Forecast

Any patchy early fog will soon clear to leave a bright day with sunny periods for most of England and Wales.

It will stay generally dry with any isolated coastal showers in the East soon dying out.

Thickening cloud will move across north-west Scotland bringing showery rain by midday, which will later spread to Northern Ireland. The rain will spread east during the day with snow likely over the hills and wintry showers in the far North-West by dusk.

Temperatures a little colder than yesterday.

London, SE, central N England, E Anglia, Midlands: Early fog, then dry with sunny periods. Wind north or northwest. 5C/41F.

Central S, SW England, CI, S Wales: Dry, clear or sunny intervals. Moderate NE wind. 6C/43F.

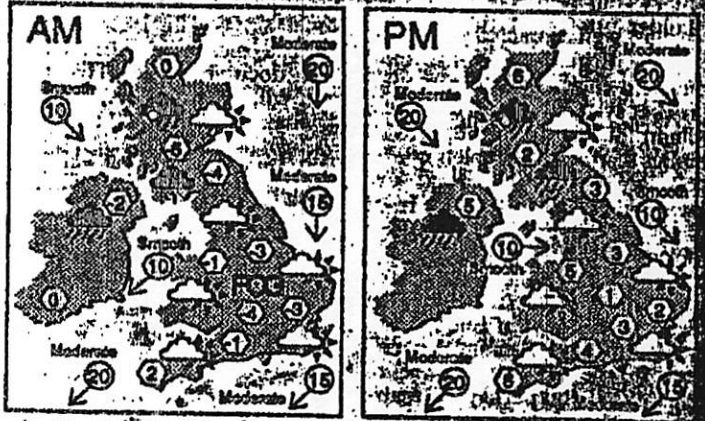
E, NW, NE England, N Wales: Dry, bright or sunny spells. Light W/NW wind. 4C/39F.

Lakes, IoM, Borders, Edinburgh, Dundee, Aberdeen, SW Scotland, Glasgow: Bright start, becoming cloudy with rain later. Light-moderate W wind. 5C/41F.

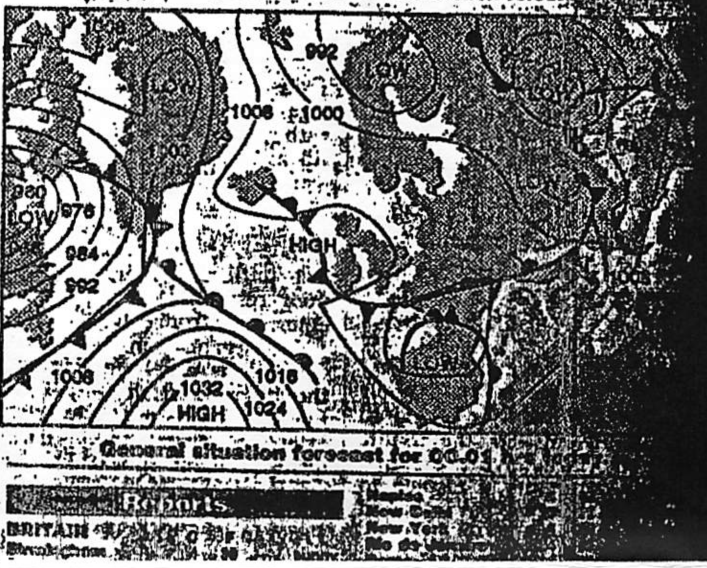
Highlands, Moray Firth, NE, NW Scotland, Argyll, Orkney, Shetland, N Ireland: Cloudy, rain spreading from West, snow on hills. Moderate-fresh W-NW wind. 6C/43F.

Outlook

On Monday most areas will be dry and bright but cloud and rain will spread into the north and west. Rain in the west will spread across remaining parts



Today's forecast for the British Isles.

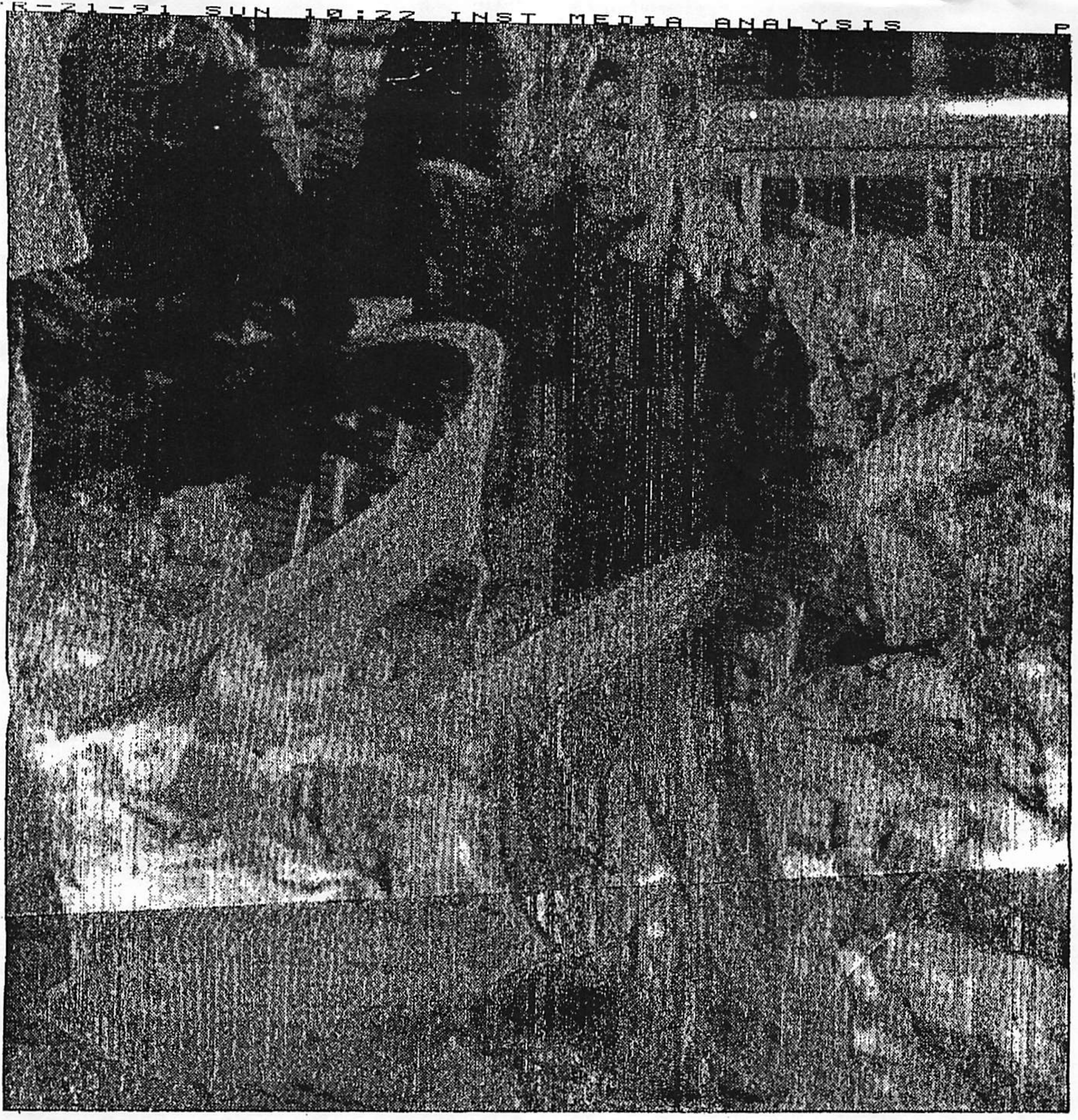


General situation forecast for 00.01

Reports

BRITAIN

New York



Tears amid ruins . . . An Iraqi boy walks through the debris of buildings destroyed by allied bombing and missile raids on Baghdad. The allies started attacking the Iraqi capital again at 8 o'clock last night PHOTOGRAPH: TAMOTSU SHINTSUKA

Iraqis are stunned as Saddam's chickens come home to roost

Lee Hockstader
In Baghdad

SURVEYING the wreckage of their shattered capital and the spectacle of their armed forces retreating under fire, many Iraqis seemed convinced yesterday that they face a daunting enemy whose main goal is their nation's humiliation, not Kuwait's liberation.

Baghdad radio reported for the first time yesterday that allied paratroops had landed in southern Iraq, blocking the "dignified" withdrawal sought by President Saddam. Many people reacted with disbelief as the consequences of their government's actions became clear. "We are obliged to fight, for our nation and honor," said Haider Jabouri, the owner of a clothing store. But had Iraq gained anything from the conflict? He shook his head. "Until now, nothing," he said.

The losses here have been catastrophic. There is no electricity, and water is scarce. Three of the busiest bridges in the heart of Baghdad have been destroyed by air raids. Fuel in one of the world's biggest oil producers is extremely difficult to find and very expensive.

On the road that leads west to Jordan, the mangled carcasses of destroyed trucks form a grim gallery. In some sections, the road is pockmarked from aircraft strafing. Along it, most communication towers are still standing, but apparently rendered useless by bomb or missile strikes.

As the danger seems to shift from the reversal of their conquest of Kuwait to the territorial integrity of Iraq, people appear to feel more directly threatened. Kuwait may or may not have mattered to Iraqis, but their own nation clearly does.

"Bush is coming in order to invade Iraq and destroy our country, not to free Kuwait," Suhad Salien, a housewife, said outside [redacted]t. "We're proud of our history and our heritage and we'll never let Bush impose his will."

Many people interviewed in central Baghdad appear to view the war in intensely personal terms, perhaps more so than they had in the past, when what was at stake was a tiny emirate that few had ever seen.

"It's true we're only 18 million, but all of us are ready to fight," said Fawzi Hussein, a lawyer. "In the new world order, which Mr Bush is so concerned with, he is not prepared to respect Iraq's strength and independence." Like many others, Mr Hussein said that Mr Bush, in league with Israel, had used Kuwait as a pretext for the destruction of Iraq.

But through the bitterness and conspiracy theories involving the supposed American-Zionist alliance, there is frank recognition here that Iraq has suffered tremendously from President Saddam's decision to invade Kuwait. In the sprawling capital of 4 million, a visitor can drive through some areas admiring the shrines and the Tigris River, then turn a corner and encounter devastation.

Near Shorja market, which is piled with rubbish but otherwise undamaged, lies the ruined complex of the central bank, its roof collapsed, its pillars buckled inside masonry lining. Crushed vehicles lie scattered on the ground. Next door is the Suk al-Benat, where youngsters used to window-shop for fashions. Now it is a mess of splintered glass and boarded-up windows — a victim of "collateral damage", in Pentagon terms, from the hit on the bank.

While commercial life has been impaired by the relentless bombing and missile attacks, it has by no means ground to a halt. In the Shorja market, a busy retail trade goes on, squeezed but not choked by shortages and higher prices. Candles, which are in great demand as the main source of light, have quadrupled in price. Eggs, like many other farm products that must be trucked to the capital amid fuel shortages, cost five times as much as before the war. But sweets, nuts and spices, kitchen utensils, children's clothing, shoes and paper products are all in abundant supply.

Life seems to have become difficult, but not impossible. "We are living as normal a life as possible and tending our offices despite the lack of petrol," said Soad, a typist in one of the central bank buildings spared from destruction.

Was the annexation of Kuwait worth so much suffering? "There were many more important matters," she replied. — Washington Post

Written under Iraqi reporting restrictions

CENTRAL
TARGETS- BANK
collateral damage

The Guardian